THE ENGINEERING RECORD
PUBLISHED WEEKLY BY THE
McGraw Publishing Company
MAIN OFFICES:
114 LIBERTY STREET, NEW YORK.
BRANCH OFFICES:
PHILADELPHIA: 929 Chestnut Street.
CHICAGO: 1140 Monadnock Block.
CLEVELAND: Cuyahoga Building.
LONDON OFFICE: Hastings House, Norfolk St., Strand.

SUBSCRIPTION RATES:
United States, Canada, Cuba and Meixco....$3.00 a year.
Foreign subscription .... 6.00 a year.
25 shillings. 25 marks. 31 francs.
Foreign subscriptions may be sent to our London office.

NOTICE TO ADVERTISERS.

Change in advertisements intended for a particular issue should reach the office of THE ENGINEERING RECORD by 10 A. M. Monday of the week of issue. New advertisements can be received up to noon of Wednesday of the week of issue.

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Entered at the New York Post-Office as Second Class mail matter.

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Of this issue of THE ENGINEERING RECORD 12,000 copies are printed. Total circulation to date 283,500 copies.

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A Contractor's Responsibility for an Engineer's Work.

A letter from a well-known city engineer, who desires to have his name suppressed, appears elsewhere in this issue, to which attention is particularly drawn. It refers to the practice of some engineers of making a contractor responsible for the accuracy of their work. In this particular case the work was the giving of lines and grades for street improvements. This is not particularly difficult, but it involves a hunt for the public records of the legally established street locations and considerable instrumental work in running them in on the ground. This is just what the engineer is paid to do, and, so far as the contractor is concerned, the stakes set by the engineer must govern the construction. If an error is discovered in them the contractor is morally bound to point it out, but it is not his business to hunt for mistakes. If he is required to supply these checks he must be paid for it, and in such a case the city will have to pay twice for its engineering work. No contractor looks upon such obligations as part of his tithes for charity, and if he is the kind of a man the city ought to let its contracts to, he will get his pay in one way or another for all the engineering work forced on him.

This case is very simple in comparison with that presented occasionally to contractors for large power plants. Minutely detailed plans and specifications are sometimes drawn to govern the work, and yet the contractor must guarantee the satisfactory operation of the plant. He has nothing whatever to do with its design, very little choice in the selection of the building materials and none in that of the machinery. The factors which cause the success or failure of the plant are wholly in the charge of other people. What possible explanation can be given for making him responsible for the good character of these plans, it is difficult to surmise.

Still another case often arises. A piece of work requires a large amount of trenching, perhaps several miles of it. The engineer bases the estimate of the cost of this work, which in some cases determine whether his clients will undertake it, upon his knowledge of the character of the materials in which the trenches are excavated. In presenting plans and specifications to the contractor he rarely explains just what information he possesses concerning the character of the materials. The contractor is warned that all the data of this kind which are given him are not guaranteed as to accuracy. Accordingly he has to spend considerable time and money sinking test pits or making inquiries among people in a position to know the facts. The alternative is to guess at the facts and to make a contract which is as much a gambling venture as a bet on a roulette table. It is not surprising, in view of the difficulties attending pipe laying and sewer construction as now carried on, that many contractors refuse to engage in such work, but it is surprising that so many engineers continue to estimate the cost of such construction on the basis of data that few contractors would consider at all reliable.

The increase in the number of technically educated engineers is gradually changing these conditions, it is gratifying to observe. Most engineers would feel insulted if any reflection were cast on the accuracy of their work, and this class does not insult itself by requiring a contractor to guarantee that its plans will work and that its estimates are correct. Very likely this unfortunate practice is a relic of the dark ages when engineers amounted to little more than clerks or agents of their employers, and the success of an undertaking actually depended on the contractors. In such cases it would be proper, though mortifying, for an engineer to require a contractor to be responsible for the engineering work. The pernicious practice of making specifications by copying those prepared by some other person, possibly for a work of different character, may be the real cause for some of the requirements occasionally seen to-day, which are a reflection on the engineer's knowledge none the less slighting because written by himself.

In this connection attention may be drawn to Wait on "Engineering and Architectural Jurisprudence," section 507, where he says: "When an engineer is a public officer and certain duties are required to be performed by him, he cannot delegate them to an assistant." He certainly, therefore, cannot delegate them to a contractor.

The Design of Reinforced Concrete Beams.

There has been a consistent recognition in The Engineering Record of the excellent properties of concrete-steel ever since its first use as a structural material; but, on the other hand, its readers will doubtless agree that this journal has also been alert to the fact that the material has been injudiciously pushed into use in some quarters through ignorance or commercial motives, or both, with results that have been disturbing, to say the least, to those who appreciate its real merits. This latter observation bears particularly on the use of concrete-steel in the walls of some buildings that have failed when there should have been no failure, and in other relatively thin or plate-like masses where the highest class of design and the best fabrication of material are imperative for satisfactory results.

Concrete-steel members require the most scientific design available to the engineer at the present time. No abstruse theory is required, but suitable formulas based upon well-considered simple theory tempered by experimental investigation, and especially by empirical factors determined by such investigations. There are available the results of a large amount of such experimental work, but unfortunately these results have not always been employed in the wisest manner. There are few or no conditions of stress in any structural material used in engineering practice which can be subjected to exact analysis, and that found in the simplest beams whether of wood,, steel or concrete or any combination of the latter two, is no exception. It might be supposed that if analysis of flexure in a beam of one material only is more or less obscure it would be doubly so in a beam of two combined materials like concrete and steel. Although that does not necessarily follow, it would at least seem reasonable to anticipate that the formulas established for the compound beam would not be based upon a more elaborate or refined analysis than a similar beam of a single material. If exact laws of stress cannot be stated for the latter, they certainly cannot be postulated for the former.

Again, the form and disposition of the steel reinforcement will depend for effectiveness on its ability to take the stresses which it is intended to carry. A proper design of that reinforcement can only be reached by at least an approximately correct conception of stresses acting in the combined material under loading. Like all patented inventions, those relating to steel reinforcements are each claimed by its advocates to meet most efficiently requirements of this kind. Under such conditions The Engineering Record believes it is rendering a valuable service by publishing in the last two issues the comprehensive papers on "The Design of Reinforced Concrete Beams," by Mr. George H. Blakeley, M. Am. Soc. C. E. Although the first paper is confined wholly to the consideration of floor-beams with steel bars on the tension side only, the main features of the treatment, so far as the theory is concerned, are clearly set forth.

The writer of these papers rejects at the outset the conclusion of some French experimenters "that reinforced concrete has a total elongation before rupture about ten times greater than plain concrete." There is a consideration regarding that point, however, which he does not set forth. If any material whatever has embedded in it a bar of much stronger and stiffer material, and if the compound bar be subjected to any degree of tensile stress less than that required to "neck down" the stronger material just before rupture, but not great enough to fracture the surrounding weaker material, the latter will be prevented from local stretching and will necessarily show far greater total tensile strain at rupture than if it acted alone. If, for instance, a bar of 100,000-lb. nickel steel of suitable sectional area should form a core of a large bar of 50,000-lb. carbon steel the necking down or final local contraction of the latter would be largely prevented and the total elongation at rupture would greatly exceed that of the soft steel bar alone. While it may not be possible to accept Mr. Blakeley's conclusion on this point, his neglect of the resistance of concrete on the tension side of the beam is certainly to be commended; indeed, no other procedure should be followed.

For some reason the fact that the ratio of stress divided by strain does not remain constant as concrete is progressively loaded to failure seems remarkable to probably the majority of writers on concrete-steel. They proceed at once to speculate as to the law under which the modulus of elasticity varies from initial stress to ultimate resistance, as well as to suggest all sorts of laws, from the straight line to the parabola, for the variation of intensity of stress from the neutral axis to the exterior surface of a bent beam. In general Mr. Blakeley rejects the parabolic law, but accepts it as a special case and provides for a varying modulus of elasticity corresponding to the varying intensity of compressive stress in the concrete of the reinforced beam. In his notation he provides for as many as four different moduli. When it is remembered that the modulus of elasticity for cast iron is a more variable quantity even than that for concrete, it seems strange that the modulus for concrete should be considered so erratic. So uniform a metal as steel has a more varying modulus of elasticity above the elastic limit than even concrete. Although formulas for the ultimate resistance for iron and steel beams are constantly used as deduced under the common theory of flexture, some authorities shrink from the same simple and sensible formulas for concrete. A short examination of any series of reliable tests of concrete in compression will show that the modulus of elasticity is either essentially or exactly constant in nearly all cases for higher stresses than are ever used in engineering structures. It is exceedingly difficult, therefore, to find any sufficient reason for complicating the theory of concrete-steel beams by considering variable those quantities which are universally considered constant in the common theory of flexure as applied to every other material than concrete, some of which are far more erratic in character than the latter. Such forced features of analysis contribute nothing to accuracy, add to the intricacy and difficulties of practical application and make resort to experiment to determine empirical quantities at least as imperative as before.

Factory Power from Central Stations.

A few years ago Dr. Perrine aroused considerable discussion at a meeting of the New England Cotton Manufacturers' Association by advising the operation of textile mills grouped near each other from a central power station. That proposition is one involving large amounts of power, but it is different only in degree from the proposition presented in every large city where manufacturers have an opportunity to purchase power from a central station. Few of these installations compare in size with the equipment of a textile mill, yet they are often large enough to make a 100-h.-p. power plant work up to its full capacity. This plant represents a considerable initial investment which would be largely lost if electric motors were substituted for it, and the total cost of power in most industries is so small a percentage of the total operating expenses that there is little incentive for making small improvements in it. There is, however, another aspect of this matter which deserves careful attention. It has been mentioned a good many times, but it must be pointed out many more times before its force is properly appreciated.

In the average city manufacturing establishment, it is important to economize space and to secure the best possible illumination. What electricity will do in this respect was shown in two similar plants recently inspected. In one of them not a belt was in sight except those forming parts of machines. Although the rooms containing the machinery were not high, they were well lighted everywhere by the use of suitable glass in the windows and plenty of clean white paint on the walls and ceilings. The machinery was close together, huddled up in fact, but it was as clean as good attendance could make it. The output of this shop was excellent. The second shop was somewhat larger, the machinery was spaced unusually far apart for a city plant, but it appeared far more complicated because the air was full of belts. These cut out the light and made it difficult to keep the machinery clean. Consequently, the floor was filthy, and naturally enough the walls and ceiling were black with the dust of years, while the windows were so dirty as to admit but little light. The product turned out in this place was as much inferior to that of the first shop as its condition was below that of the first. Moreover, it is impracticable to keep the second shop anywhere near as clean as the first or to make it so handy to work in, because of the presence of the maze of belts and overhead shafting. This journal has not been a hide-bound advocate of the electric drive, as its readers are aware, but since the inspection of these two shops its views on the importance of individual electric motors have been altered, so far as city plants are concerned, where it is particularly important to save space and to secure good illumination. In such cases, it will probably be found that a small extra expense for power will be more than offset in many cases by the improved working conditions which can be afforded where the motor is used, and if this improvement in working conditions does not produce a better or a larger output than under the old conditions something is wrong with the management.

At the present time some reluctance to installing motors taking current from large electrical corporations is shown in many cities. It is felt that the cost of current is high and that it is not safe to rely on a single company for power. The latter argument is baseless, for it is safer to secure current from a large corporation than from a small isolated plant tucked away in the basement of a dingy building. The cost of the current will probably be a little higher than the cost of the same amount of power supplied by the isolated plant, if the latter is well-kept and adapted for its purpose. On the other hand, few of these plants answer this description, and if they furnish power by the wabbling shafting and patched and slipping belts which disfigure most city shops, it is safe to say that the cost of the power by the time it is actually applied to the machines runs up to a high figure. It must be borne in mind, however, that in many buildings power is furnished by the owner of the property to the tenant and that its expense is hidden in a lump sum paid as rent. Under these conditions the central stations have a difficult campaign of education to carry on before they can show the usefulness of small motors to the class of shops under consideration.

This matter was up for discussion at the meeting of the National Electric Light Association this week, and an interesting paper on the subject was read by Mr. E. W. Lloyd. The basis of his paper was practically that outlined above, namely, that the advantages of the electric motor depend on the motor installation rather than on any saving of expense in power. He made the point, which is a most important one, that a proper motor installation has everything to do with the economical furnishing of current from a central station. In many cases factory power is lost to central stations because the motor equipment eliminated none of the wastes in the shops which were in evidence when they were driven from an engine. Hence, he urged giving assistance in laying out the electrical equipment so that it will be sure to bring about all the improvements which its introduction permits. The problem is not how many motors can be jammed into a shop, but how to use electricity so that the shop will be as good as it is possible to make it in such a location. As a rule, this will involve the use of a large number of small motors, which, in a larger and better lighted country shop, might be replaced in part by short shafts and belts. Such considerations are details, however, compared with the fact that the city shop must be considered as a whole and that all improvements rendered possible by the electric drive must receive attention as well as the minor one of the actual cost of power at the different machines.

The Most Important Improvement in Marine Engineering.

The interesting paper on epochs in marine engineering, presented at this week's meeting of the American Society of Mechanical Engineers, by Rear Admiral George W. Melville, enables those who are not specialists in this branch to make an intelligent survey of it. In such an examination the question inevitably arises as to what has been the most important improvement, for it is an instinctive habit to seek the leading factor in any development that has extended over a number of years. In some cases this is readily found; with lofty office buildings it has been the elevator, for example, which alone makes such structures of value. In steam engineering, however, the most important improvement would probably be overlooked except by some one having an experience going back many years and the intimate knowledge of the subject that could only be obtained by actual work as a designer during this long period.

The adoption of the paddle wheel, the propeller, the compound engine, the surface condenser, the cylindrical boiler, the water-tube boiler and very likely the steam turbine have all been important factors in the progress of marine engineering, yet they have not been the leading ones. The reason for this was well stated by Sir William H. White at St. Louis last fall, when he pointed out that the marine engineer not only had to solve the same kind of structural and power problems that confront the landsman, but he also has to float his work.

Less than thirty years ago a great problem was that of reducing the weight of the machinery in a vessel. It remains a great problem to-day, but not for the same reason. Boiler plates were very thick, for they were made of wrought iron, in which laminations were always possible. A propeller shaft was clumsy, because the wrought iron of which it was made was liable to all sorts of defects, of which even the names convey no definite meaning to many to-day. Cast-iron parts had to be heavy and of large size in order to be safe. In all designs it was necessary to use a factor of safety of eight or ten.

To-day the factor of safety is five or a little less, resulting in an enormous saving in weight as well as other advantages. This has been brought about by the introduction of steel. Admiral Melville states that he does not see how it would have been possible to build engines of the size and power now common, with wrought iron for piston and connecting rods and shafting. It is certain that the cylindrical boilers in use to-day could not be constructed, he says, of that material. He acknowledges that it is difficult for young engineers familiar almost entirely with mild steel and practically unacquainted with wrought iron, to realize what a change came in marine engineering when the production of mild steel became a commercially reliable matter. Looking back at the way in which some of the vital elements of a big marine engine were built, he is almost inclined to wonder that they were successful at all. The difference between a large wrought-iron shaft as made at the Morgan Iron Works, and a mild steel shaft forged at Bethlehem is too great to be described.

These conclusions by a man who has not only witnessed, but has also done a great deal to mould, the development of marine engineering, may be accepted as accurate. The problem has been to secure the maximum power with the least space and weight, and the steel maker, by furnishing a reliable material of high and uniform strength for boilers and engines, has done most to solve it.

The Effect of Water on Rock Powders.

Engineers have grown accustomed to look upon any publication of the Division of Tests of the Department of Agriculture as worthy of careful study, and the latest of these, on the effect of water on rock powders, will be found to more than equal the expectations warranted by past achievements. In it, Dr. Allerton S. Cushman explains the latest investigations made by himself and Mr. L. W. Page to determine just what takes place during the phenomena that are observed when rock powders are wet. In previous reports of the Division it has been pointed out that water produced a colloid or glue-like surface condition of these very fine particles, leading to plasticity in the wet mass and binding power on induration. It was also shown that most rock powders, when mixed with water to the consistency of a stiff dough and allowed to stand, gradually increase in binding power up to a maximum constant value at the end of about 24 hours. If this wet mass is kneaded by hand the binding power rises to a much higher value. This has long been observed in clay-working, where the kneading of the clay is a recognized part of the industrial process, but the similar facts regarding rock dust have only lately been well determined.

It has recently been determined by Mr. Page that the cementing properties are greatly changed by grinding the rock dust in a ball mill with one-fifth its weight of water. If this product is compared with dust ground dry for the same length of time, mixed with water into a stiff dough and allowed to stand for 24 hours in the usual way, it will be found to have much higher binding powers. The practical road builder has long known that wet rolling will cause macadam to bind, and most builders hold the opinion that protracted wet rolling, when carefully done, improves the binding. These experiments at the laboratory of the Division of Tests throw light on the reason for this fact, and indicate the possibility of improving the quality of a road by the addition during rolling of certain substances in dilute solution. While this is still conjectural, its importance is readily understood by those who are aware how far rocks will furnish such a compacted surface as to be practically free from mud and dust under average traffic.

Some of the facts brought out in the recent investigations are very surprising. For example, it has been found that powdered glass can be made to exhibit marked binding properties. Probably no road builder would consider for a moment that glass could by any possibility have any cementing value, and in some of the earlier reports of the Division of Tests it was pointed out that powdered glass had few or no properties of this sort, even when prepared in the finest possible state of subdivision by dry grinding and elutriation. In following up the experiments with rock powders, just mentioned, plate glass was ground wet in the ball mill, and the product made into briquettes which were found to become so hard that they could not be broken in the hands or indented by the finger nail. This led to an examination of the reason for this unexpected result, which was found to be due to the action of water on the glass producing enough glue-like sodic silicate to cement the particles. From this fact an investigation has been made to determine whether the binding power of rock dusts could not be attributed to analogous causes. This study covers too many features to be reviewed here, but has led to the following conclusions:

The effect of wet grinding is to increase the binding power or cementing value of rock powders, and there are indications that the addition of small amounts of suitable electrolytes to the water will still further increase the action. When water comes into contact with most rock powders immediate reactions take place, which are, to a certain extent, analogous to those which occur with cement and powdered glass. These reactions are shown by the alkalinity indicated by phenolphthalein, but this alkalinity is, to a great degree, inhibited if the solid particles are filtered out. The microscope reveals an accumulation of amorphous material of a gummy appearance largely associated with the surfaces of the crystalline particles as the action of water proceeds. It is apparent that the behavior of rock powders after being acted on by water is similar to that of coagulated colloids artificially prepared in the laboratory, and that the formation of colloids on the surfaces of the particles would account for the increased binding power under the action of wet grinding.

The practical value of these investigations in their present stage is not great, it may be admitted, yet the promise they give of pushing forward the limits of our knowledge of road-building materials is a bright one. It has been generally considered that the only way to become a good road builder is to secure experience under an expert. It is commonly believed that the knowledge of the properties of different rocks which will enable a man to decide what is good and what is bad can only be acquired by the test of actual construction. For this reason road-building is looked upon much like gardening by most people, as a calling that requires no very great amount of knowledge or skill. The work of the Division of Tests is important as showing the wide range of research that must be carried on before road building will come under the classification of "directing the forces of nature for the use of man." At the present time these forces are unrecognized save in an indefinite way as revealed by rough experience. The investigations in Washington are making known the scientific reasons, the fundamental natural laws, on which road building must rest, and their progress affords encouraging proof of the help that science can give to engineering when the two work in harmony.

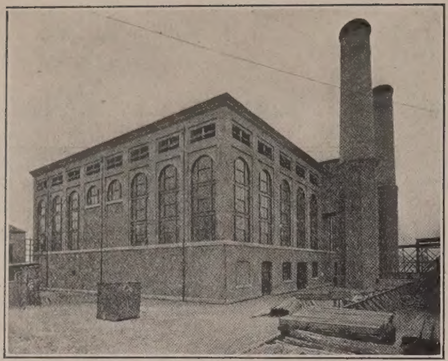
Notes and Comments.

The Enlarged House of the American Society of Civil Engineers will probably be ready for use in September. The extension will be of the same height as the present house and plans for it have been prepared by Messrs. Eidlitz & McKenzie, who designed the main structure. The alterations contemplate remodeling the first floor so as to give a large reception hall, improving the entrance to the lounging room, providing a rear stairway between the lounging room and the auditorium above, which will have its seating capacity increased from 400 to 600. The plot now owned by the Society is approximately 75 x 113 ft. in size.

Setting Curb in Concrete has been definitely adopted as the standard method in Buffalo, where experience has shown the impossibility of setting the curb in sand in such a manner that it will preserve its alignment. In the last annual report of Mr. C. M. Morse, deputy engineer commissioner, it is pointed out that when streets are repaved it will not often be necessary to reset the curb if it has been set permanently, and when the surface of the pavement is in such condition that the elevation of the base cannot be determined, the fixed curb line will generally indicate the grade of the original pavement. Mr. Morse says there has been controversy over the amount of binder required in repaving with asphalt, simply because it was impossible to state in the specifications how much would be needed to bring the new pavement to the required grade and cross-sections. Moreover, there is a disposition to construct concrete walks out to the curb, and it seldom happens that the old curb represents the grade with accuracy,

The Technical Meetings to be held this month at Atlantic City will make that place an engineering headquarters. Next week the Association of American Portland Cement Manufacturers will hold its quarterly convention there and on Wednesday its sessions for the reading of technical papers will be open to all interested in the manufacture and use of cement. The papers will be on grinding, air separation in connection with grinding, reinforced concrete and hollow concrete block construction. On June 28 and 29 the Society for the Promotion of Engineering Education will hold its thirteenth annual meeting at the Hotel Chalfonte, and an unusually full programme has been arranged. This meeting has been so planned that the members will be able to attend the convention of the American Society for Testing Materials, which in some respects is the most important of the national technical organizations of an engineering nature. Its meetings will be held on June 29 to July 1 at the same hotel, and the programme will be more interesting than those of previous conventions, good as those were. It should be added that parties attending the latter convention will be able to secure reduced railroad rates on the certificate plan.

The Speed War between the Pennsylvania and the New York Central roads is interesting as an indication of the improved condition of the Pennsylvania system for handling fast trains. A few years ago it put on a twenty-hour train between New York and Chicago, but the congested condition of the tracks, particularly in Pennsylvania, made it impracticable to maintain the schedule without undue sacrifice of freight traffic. Since then great improvements have been made in the facilities for handling freight and the tracks are now so clear that an experimental train made the through trip not long ago in seventeen hours. The Pennsylvania managers have accordingly put on an eighteen-hour train between Chicago and New York, beginning the service on June 11. The Central authorities, who have had little trouble in maintaining a twenty-hour schedule for the Twentieth Century Limited, will cut two hours off its running time beginning with June 18. The distance by the Pennsylvania route is 912 miles and by the New York Central 837. The struggle of the time-tables will be watched with much interest by engineers, because it will demonstrate how well recent great improvements by both companies in their facilities for keeping freight from blocking the tracks near important cities answer the expectations of those who planned them.



The Power Station.

Quincy Point Station, Old Colony Street Railway Company.

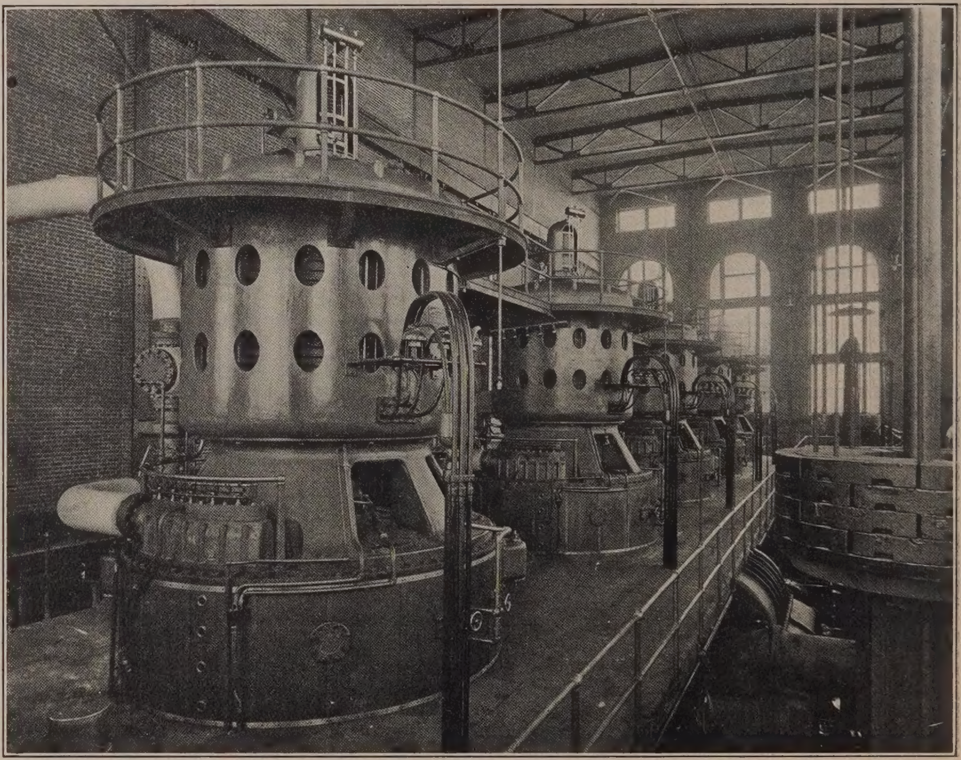
The Old Colony Street Railway Co. operates about 400 miles of electric lines in a 30x70-mile district between Boston and Newport. When the properties were taken over late in 1902 some of them were old and some new, and were operated from eleven independent power plants. Few of these stations were located satisfactorily for the operation of the consolidated lines, and some were unable to produce current economically. They were all direct-current plants, and a considerable portion of the equipment was not of the type now considered best adapted for the work. It was accordingly decided to replace the direct-current stations by two alternating-current plants, one 8 miles from Boston at Quincy Point and the other at Fall River, furnishing high-tension current to substations near the old power plant.

The main station at Quincy Point contains five Curtis vertical steam turbines, each of 2,000-kw. normal capacity and each direct connected to an alternating generator delivering three-phase, 25-cycle, 13,200-volt current. This station, by the way, is the first plant of its kind in this country using steam turbines exclusively for electric railway purposes. The current is transmitted at the initial voltage to the substations, of which at the present time six have been installed. The scheme provides for three additional substations, which will be installed as needed.

The location of the plant on tidewater gives excellent opportunities for receiving coal and an abundance of water for condensing purposes. The building is divided into two practically equal parts, for the boilers and turbo-generators, respectively. Extensions can be readily made by lengthening the building at one end. The station is now operating with five 2,000-kw. Curtis vertical steam turbo-units. As these were among the first built they were originally fitted with an oil step bearing. This was changed to a water step bearing, which is now the standard. The turbo-units have been placed in a single line the full length of the station, and are connected by both lower and upper galleries so that the work of the attendants is brought to the highest possible efficiency.

The fields of the alternators are excited by a 75-kw. General Electric engine-driven exciter set, the engine being of the vertical compound type and running at 310 r. p. m. There is also a 50-kw. General Electric engine-driven exciter set running at 400 r. p. m. In addition there is an auxiliary motor-driven exciter set of 50 kw. capacity, driven by a 50-h.-p., 350-volt induction motor. Each turbine has its own condenser, which is of the Admiralty surface type as made by the Wheeler Condenser & Engineering Co. These condensers draw water from a concrete intake that extends under the line of turbo sets, and the water is discharged through a similar conduit running parallel to the first. The intake receives salt water from the bay at one side of the building, and the discharge empties into the bay on the other side of the building. The turbo-units are arranged in staggered relation with respect to the intake and discharge sewers—that is, the first unit has its condenser on the right-hand side, the second on the left, and so on alternately. This arrangement requires the suction and discharge pipes of certain of the turbine condensers to be carried under or over one or other of the culverts in order to make connection with the proper one, but this slight complication is much more than counterbalanced by the saving in floor space, inasmuch as any arrangement whereby the turbine condensers were kept all on one side of the center line would necessitate considerable lost room between each unit.

The air pumps and circulating pumps for four of the turbo-units are motor-driven, but the fifth set is steam-driven. In the former sets the circulating pump consists in each case of an 18-in. low-lift pump direct-connected to a 100-h.p. General Electric motor. The air pump is an Edwards triplex 18-in. by 12-in. pump direct-connected to a 50-hp. General Electric motor. All the motors are of the induction type operating on 350 volts.



View of Turbine Installation, Quincy Power Station, Old Colony St. Ry.

On the fifth unit, where the pumps are steam-driven, the circulating pump is of the 18-in., low-lift, double-suction, Morris type, direct-connected to a 12-in. by 10-in. engine, and the air pump is of the Edwards triplex type, 18 in. by 12 in., connected to a 10-in. by 10-in. engine.

The condensed water passes from the condensers to three tanks connected in series, each 20 ft. long by 6 ft. in diameter, located in the boiler room, and which serve the double purpose of a hot well and storage tanks. The feed water for the boilers is taken from these tanks, which are connected to the city mains by automatic apparatus so that if the supply of feed water falls below a predetermined amount the connections to the mains are opened.

For supplying water under pressure to the step bearings of the turbines there are three steam-driven pumps with accumulators able to supply sufficient water to the bearings to run the plant for about ten minutes, or for a longer period of time than it would take to shut down the machines affected.

The switchboard at this station is of rather unusual design. All high-tension switches and appliances are controlled electrically by low-voltage auxiliary circuits manipulated from a bench board placed in front of the low-tension panels, and so arranged as to permit the operator to face the main engine room when controlling the main machines.

Steam is generated in ten 750-h.p. water-tube boilers, arranged in two lines facing each other, with a wide aisle between. Eight of the boilers were furnished by Aultman & Taylor and two by Babcock & Wilcox.

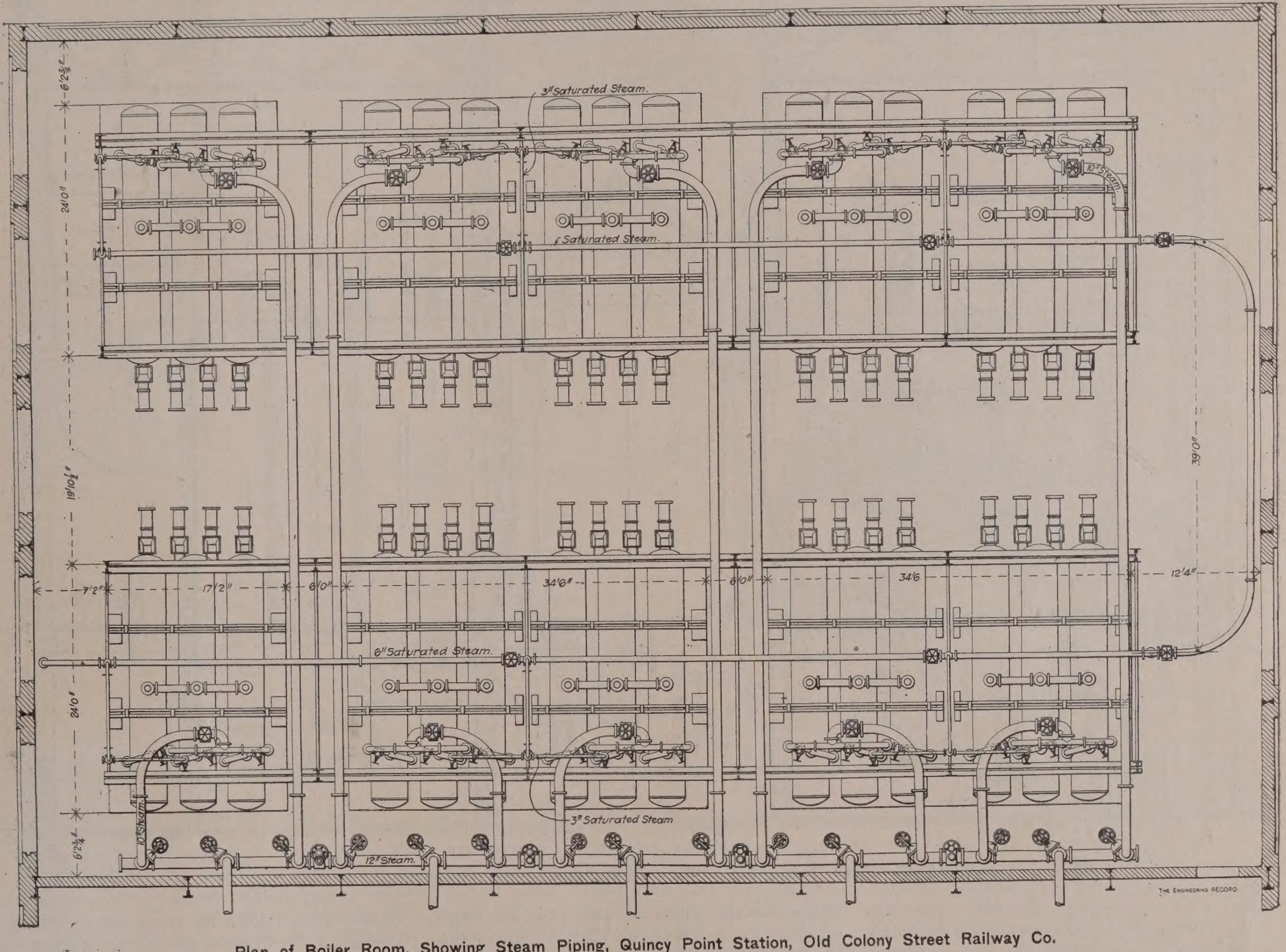
The boiler room floor is 14 ft. above grade, this arrangement giving a sub-cellar, which is utilized in part for ash tracks, the ashes being allowed to drop from in front of the boilers directly into carts which run over a narrow gauge track, and the ashes are used for filling in the property around the power station.

Each battery is provided with an engine-driven blower for forced draft, furnished by the B. F. Sturtevant Co. The eight Aultman & Taylor boilers are equipped with Jones under-feed stokers.

Under normal conditions the turbines are operated with superheated steam, all of the boilers being fitted with internal superheaters, the Aultman & Taylor batteries having Foster superheaters and the Babcock & Wilcox having superheaters of the Babcock & Wilcox type. The arrangement is such that the degree of superheat in each unit can be regulated to a nicety, and the station can be operated, if desired, with part of the boilers giving superheated steam and part saturated. By means of the unusually flexible layout of feed and steam piping, comparative tests can be made at any time with any portion of the boiler room equipment delivering superheat and any other portion giving saturated steam.

The feed water is normally taken from the hot water storage tanks, which receive the condensed water from the condensers. It is then pumped by steam-driven Snow pumps to the heaters, which are of the National type. All the feed water piping over 3 in. in diameter is cast iron, and less than this size is brass.

The main 12-in. steam header is carried on roller pedestals just above the boiler room floor and extends along the partition wall that separates the boiler room from the turbine room. The steam passes from each battery of boilers through 10-in. bends and connections, and is carried from the header to each turbine by a straightaway 10-in. bend, as indicated on the drawing. In designing the piping, the aim has been to secure a high degree of flexibility so that any set of boilers or combination of boilers can serve any one of the turbo-units.



Plan of Boiler Room, Showing Steam Piping, Quincy Point Station, Old Colony Street Railway Co.

At the present time coal for this station is delivered from vessels at a wharf alongside the power house. It is unloaded by means of shears, and is delivered to the crusher hoppers of the coal-conveying apparatus, which are located in a concrete tunnel that extends from the wharf to a point under the boiler room. The line of bucket conveyors travels through this tunnel and then rises to the coal storage bins above the boilers, from which the coal is fed to the stokers through chutes. The entire coal crushing and handling apparatus is of the McCaslin type, manufactured and installed by J. A. Mead & Co. The coal conveyor is actuated by variable-speed, alternating-current motors working on 350 volts. Eventually an elevated coal storage bunker will be erected near the water edge, and the shears will be supplanted with a modern coal-elevating system for unloading vessels.

The broad scheme for power layout calls for nine sub-stations distributed over the territory, so that each sub-station will serve an area of about five miles in each direction. These stations will be located respectively at the following points: Quincy Point, Brockton, Milton, Rockland, Bridgewater, Taunton, Fall River, Lakeville and Portsmouth, R. I. At the present writing six of these stations have been installed.

There are two 13,200-volt transmission lines running out of Quincy Point. One of these extends south to Fall River, and serves the sub-stations at Brockton, Bridgewater, Taunton and Fall River. The second line serves the sub-station at Rockland, and is then tied in with the station in Brockton. The transmission wires are strengthened aluminum cables, equivalent to 262,000 circular mil capacity. On straight lines the wires are carried on 35-ft. poles, and the three phases are carried flat on the pole tops, except where there are two circuits on the same pole line, in which case the circuits are connected in double delta.

Inasmuch as it was necessary to run the transmission lines through several municipalities, it was thought best to carry the high-tension cables underground through thickly populated districts. At each point where the line enters or leaves the underground conduits there has been erected a terminal house in which are located disconnecting switches, lightning arresters, etc.

CONCRETE BLOCKS made of one part of cement and two parts of fine crushed granite, in which macadam metal is bedded, are being tried as a pavement on several Liverpool streets.

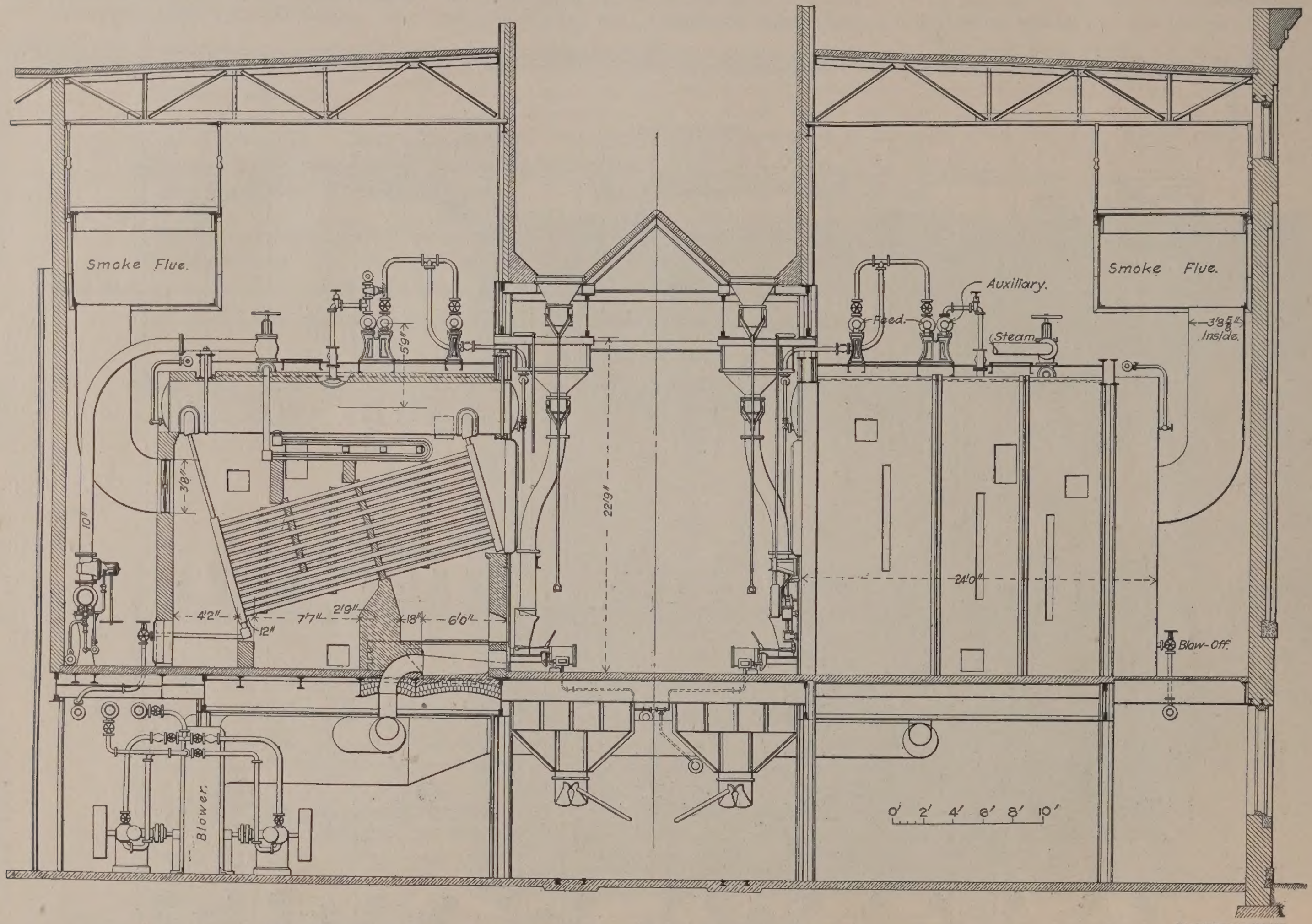
Counterweights for Large Engines.

The correction of the vibrations of engines is a problem so rarely presented to engineers that an example of it, explained by Prof. D. S. Jacobus in a paper before the American Society of Mechanical Engineers this week, is of unusual interest. He was called upon to investigate the problem of lessening the vibration of the engines at the new Manchester Street power station of the Rhode Island Co., Providence, R. I., and working conjointly with Mr. Fred N. Bushnell, the chief engineer of the company, he recommended that certain counterweights be added in addition to those already on the engines. These counterweights, which were exceptionally large, were adopted and gave satisfactory results. In addition to the problem of lessening the vibrations certain electrical problems arose regarding the effect of the counterweights in increasing the variation in angular velocity of alternating current generators run in parallel with each other. A number of measurements were made to determine the action of the counterweights, both as affecting the vibration of the building and the tendency of the alternating current generators to break apart when run in parallel.

The counterweights were applied to three engines, all of which were of the same cylinder dimensions, 32 and 64 x 54 in., and had the same weights of reciprocating parts, 31,775 lb. They were built by the Filer & Stowell Co., of Milwaukee, Wis., and are of the horizontal cross compound type directly connected to electrical generators. Two of the engines, designated as

Nos. 1 and 2, were connected to 1,500-kw. alternating current generators, and one, designated as No. 3, to a 1,600-kw. direct current generator.

On inspecting the plant it was evident that something should be done to diminish the shaking. The entire building rested on piles which passed through silt for about 30 ft. before striking a solid bottom. There was a mass of concrete about 5 ft. thick placed on these piles, which extended under the entire plant so as to form a bed on which rested the foundations of the buildings, boilers and engines. The bed of concrete also extended under the chimney foundation. When the first observations were made the buildings were not completed. All three engines were, however, installed and were protected by a temporary wooden structure. The boiler plant was in the process of construction, much of the brick work having been laid, and the steel framework of the building nearly completed. A portion of the boiler plant was running to supply steam to one of the engines. The chimney, which was ultimately to be about 300 ft. high, was erected. This was built of special brick furnished by the Alphons Custodis Chimney Construction Co.



Cross-Section of Boiler Room, Quincy Point Power Station, Old Colony Street Railway Co.

The engine which was running was that designated as No. 3, and it shook the entire foundation to such an extent that the motion could be readily felt by a person standing thereon. When water was poured outside of sheet piling, which surrounded the foundation, the surface of the water could be seen to move up and down in time with the strokes of the engine.

After inspecting the plant Prof. Jacobus constructed an apparatus on the principle of the seismograph for measuring the amount of vibration. On a second visit to the plant the horizontal shake of the foundation was measured with this instrument with engine No. 3 running and found to be 0.01 in. at the engine. This may not seem to be a large amount, but as the entire mass of the building foundation shook, the movement of parts of the temporary wooden building was magnified in many places so as to be very evident to the eye. Furthermore, the ironwork of the boiler house shook considerably. That the entire mass of the foundation shook could be appreciated by feeling the vibration through the feet, and also by measuring the actual amount at different points with the special apparatus. At a point near the extreme end of the foundation where the No. 1 engine was located the foundation was found to shake 0.008 in. Measurements made near the top of the chimney, which was erected to the height of about 175 ft. above the ground, showed that the maximum shake with the engine running at its ordinary speed of 90 r. p. m. was about 0.02 in. After measuring the vibration of the chimney with the engine running at its ordinary speed the engine was shut down and a marked result took place when its speed fell in harmony with the time of vibration of the chimney. When this occurred the chimney shook to such an extent that the motion was beyond the range of the special instrument. The total movement of the pointer of the instrument was such that the chimney was shown to move more than ⅛ in. In constructing the chimney the workmen had noticed that when they came to a height of about 130 ft. the vibration was much greater than it was after the chimney was built higher. It appears that at 130 ft., at which height there was the most shake, the time of the vibration of the chimney was in harmony with the number of revolutions of engine.

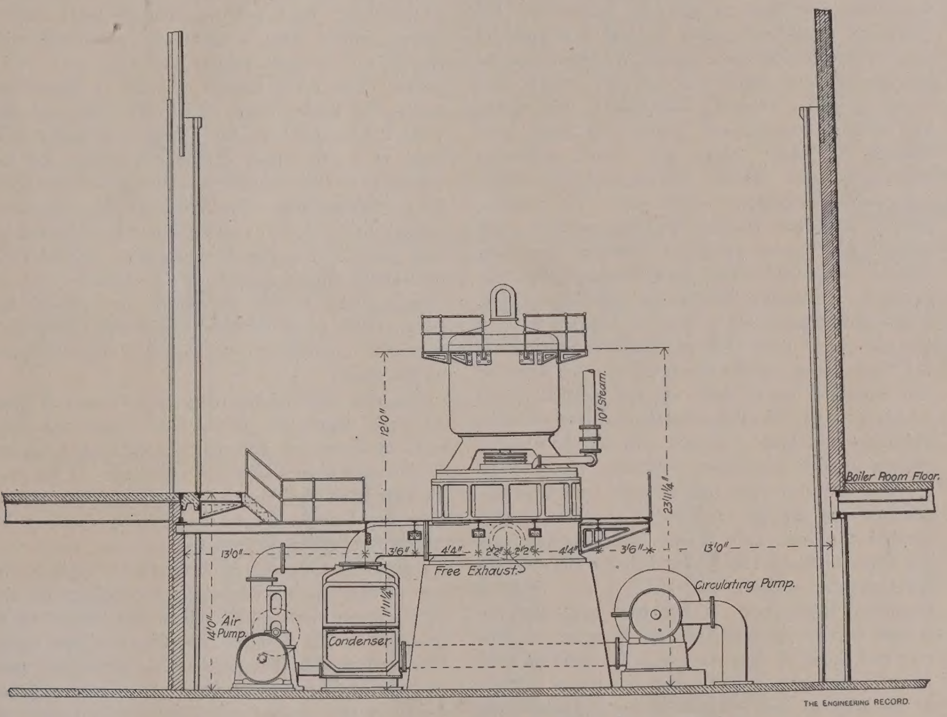
As the entire plant shook laterally on top of the piles, and as there could be no vertical movement, it appeared evident that the best plan would be to place counterweights on the engines of such sizes that they would diminish the horizontal shaking forces to nearly a minimum, irrespective of the vertical shaking forces which might be produced. This would give much larger counterweights than are ordinarily used, but on carefully considering the conditions which existed it was deemed best to adopt them. The counterweights originally on the engines were comparatively small, and it was found impossible to place large enough weights on the crank disks to carry out this plan. It was therefore decided to place counterweights on the flywheels in addition to placing as heavy counterweights as possible on the crank disks. A counterweight in the flywheel acts just as efficiently as one placed on the crank disk in eliminating the shaking forces tending to translate the bed of the engine, but with such a counterweight there remain forces which act as couples and tend to shake the engine by rotating it about its center of mass. The horizontal forces tending to produce translation were, however, the most important in the case under consideration, and these were considered irrespective of the forces tending to produce rotation.

The weight of the counterweights recommended to be added in addition to those already on the No. 3 engine was 4,995 lb. on each of the crank disks and 3,600 lb. in the flywheel, the distance of the center of gravity of the weights on the crank disks from the center of the shaft being 2.38 ft. and for the weight in the flywheel 7.67 ft. The counterweights originally in each crank disk amounted to a net weight of 1,740 lb. at 2.05 ft.

Mr. Bushnell designed counterweights for the No. 3 engine to conform with the above sizes, but when finally placed on the engine they were somewhat lighter than called for, although not enough so to produce any great difference in the results. On starting up the No. 3 engine with the counterweights it ran without appreciable vibration and operated with entire satisfaction.

Counterweights were then placed on engines Nos. 1 and 2 driving alternating current generators. As the dimensions of these engines and the weights of the reciprocating parts were the same as for the No. 3 engine, the same size of counterweights was used as for the latter, but those placed in the revolving fields were necessarily of a different form than that employed in the flywheel of the No. 3 engine. In these engines the high-pressure crank leads, whereas the low-pressure leads in the No. 3 engine, which was considered in placing counterweights in the revolving fields.

There was some delay in arranging for a third visit to the plant. The buildings and the chimney of the plant were then completed. A vertical engine directly connected to a 2,500-kw. generator had been erected and was running in addition to the three horizontal engines. It was found that the greatest shaking that could be noticed occurred on the switchboard platform which was anchored to one of the side walls of the building at a point some distance above the floor. When engines Nos. 1 and 2 driving the 1,500-kw. alternators were run in parallel with the counterweights opposed they produced but little vibration. When run with the counterweights together there was a greater vibration. The greatest vibration that could be detected on the switchboard platform with the counterweights of the two alternating machines together and all the engines in the station running, including Nos. 1, 2 and 3 and a vertical engine which is designated as No. 4, was about 0.023 in. This maximum shake occurred when the counterweights of the three engines Nos. 1, 2 and 3 fell together, which would take place about once every 15 seconds, as the two engines running the alternators ran at about 94 r. p. m. and that driving the direct-current machine at 90 r. p. m. The amount that the floor shook was measured and was found to be extremely small and less than 0.002 in.



Cross-Section of Engine Room, Quincy Point Power Station.

The ground was frozen during the above test, and it was decided that it would be best to make a final set of observations of the amount of shaking after the frost was entirely out of the ground. Furthermore, some questions arose as to the possible danger of the alternating-current generators breaking out of step when run in parallel with their field counterweights opposed, because when so run the ammeters attached to the generators swayed considerably, indicating fluctuations in the current. This swaying was, however, of an entirely different frequency from that of the strokes of the engines. The amount was noted for different relative positions of the counterweights of the engines. The engines were operating at the time under light loads. The voltmeter reading was also noted and found to be steady in every instance.

It appeared that the fluctuations in the current generated by the two alternating machines had but little influence on their efficiencies and that they were working successfully when connected in parallel. On a joint visit of Prof. Albert F. Ganz and Prof. Jacobus observations of the angular displacement of the rotating field and electrical readings were again taken, and these observations led Prof. Ganz to conclude that there was no apparent danger of the alternators breaking out of step while operating in parallel with the counterweights in any relative position.

It was found that by placing the counterweights in the revolving fields the angular variation during a single stroke is made about twice what it would have been without the counterweights. It, however, appears that the increased angular variation during a single stroke due to employing the counterweights does not introduce any great disadvantage, as the alternators can be safely run in parallel at practically the same efficiency as would exist should there be less angular variation.

A Railroad Terminal Station at Atlanta, Ga., has recently been completed at a cost of $1,630,000, of which $660,000 was for the site, covering 13 acres, and the remaining $970,000 for the building. The depot building,, which is four stories in height, is 180 x 210 ft. in size and has a main waiting room 166 x 66 ft. The train shed is of steel construction, 745 ft. long and 265 ft. wide, spanning 12 tracks.

Erection of the Channel Span of the Benwood Bridge.

The single-track bridge of the Baltimore & Ohio Railroad across the Ohio River, at Benwood, W. Va., was completed in June, 1871, and had a total length of 3,916 ft. 10 in., including an iron superstructure 1,435 ft. 6 in. long, comprising two short deck spans at one end, seven short deck spans at the other end, a through channel span (No. 11) of 347.9 ft. and three adjacent spans of about 209 to 242 ft., all from center to center of piers. The old spans had a clearance of 92 ft. above low water and of 43 ft. above high water. The substructure for the main spans consists of masonry piers built in shallow water and founded on rock. The bridge was built under an act of Congress requiring minimum lengths of 300 ft. and 220 ft. for the channel and adjacent spans and was designed for a uniform live load of about 2,000 lb. per lin. ft.

As the weight and volume of traffic has increased the original structure has developed weakness and the spans have been successively replaced by new ones designed in accordance with the requirements of the railroad which prevailed at the several times, thus eventually securing a new structure not of uniform strength. In 1893, 1900 and 1902 all but the two longest spans were replaced with new superstructures built on the old substructures by ordinary methods of falsework erection. In 1904 the two main spans were replaced on their old piers by the unusual erection method here described, which forms the subject of an admirable paper by Mr. J. E. Greiner in the proceedings of The American Society of Civil Engineers for March, 1905.

Before deciding on the design which was finally adopted, several other plans were considered, one of them for the removal of one pier and the construction of a new span of 549.48 ft. to replace old spans 11 and 12. The span could have been partly erected on falsework and would have cost about $253,000 more than the structure as now built. Another plan was for a 730-ft. and a 284.55-ft. span and piers to replace two old and two new spans, and would have cost about $563,000 more. New spans of increased depth and strength were therefore built on the old masonry and traffic was maintained without obstructing navigation under the channel span.

It was thought impracticable on account of the great variations of the water level to erect the new span at a distance and float it into position: the old span was not strong enough to carry the traffic and sustain the weight of the new span during erection and there was no satisfactory provision for bypassing the traffic during the erection of the new span; therefore it was deemed necessary to design the new span for erection as a cantilever, independent of the old span and to use it as a free span after erection.

The adjacent new through span, No. 12, 241.58 ft. long, was erected on falsework and was designed to act as an anchor arm for the cantilever erection of the 347-ft. channel span, No. 11. The other adjacent span, No. 10, 213.8 ft. long, was not strong enough to act as an anchor span and two new temporary trusses were erected from it, just outside the old trusses, to serve that purpose, being designed to move freely in vertical planes and to sustain sufficient counterweights at the shore ends. During erection the old channel span carried only the weight of the traveler and single members of the new trusses and a restricted traffic. Span 11 has pin-connected Pratt trusses with curved top chords and stiff bottom chords throughout. It was made wider and deeper than the old span so that its trusses and overhead transverse bracing cleared outside the old bridge and special steel members were made for its temporary connection to the adjacent spans during erection and to provide for erection adjustments at the center panel.

Falsework was first built under old span 12 and supported the track there and the old structure until the latter was taken down by the ordinary two-bent striding traveler which subsequently erected the new span. This traveler was 64 ft. high over all, had horizontal and vertical clearances of 53 ft. and 22 ft. 8 in. and was built entirely of timber. The falsework consisted of 15 transverse bents about 100 ft. high above the bottom of the river and was four stories high above the water. Except at the piers, where they were seated on the masonry, all bents were duplicates and their upper three stories were seated on the caps of pile bents to which they were bolted with steel scab plates as indicated in the elevation. The bents were not placed at panel points of either old or new trusses, but were spaced at a uniform distance of about 15 ft. apart and were connected by twelve lines of 8 x 16-in. stringers on top, and by four lines of 6 x 8-in. sash pieces at each intermediate cap. The diagonals were 4 x 8-in. pieces and all other timber was 12 x 12-in. Six pairs of bents were X-braced together longitudinally to make towers with one or two open panels between them.

The new channel span was so much wider than the old one that the tops of the masonry piers were cut down and steel I-beam grillages framed to plate girders, seated there to receive the new trusses and distribute the loads as indicated in the elevation of the west end bearing. The temporary anchor arm trusses were built on piers 9 and 10, and seated on loose 6-in. pins with open concave bearings in cast-iron top and bottom blocks which allowed a slight longitudinal movement of the trusses. A timber track of 19 ft. gauge was blocked up from the curved top chords of span 10 and the horizontal top chord of span 11 and on it a steel traveler was assembled to erect new span 11. The traveler was of simple tower construction with four 30-ft. booms and was braced with diagonal clevis and sleeve nut rods in each face. The upper transverse beams overhung the vertical posts about 9 ft. and carried, in the planes of the new trusses, jigger beams made of pairs of 15-in. I-beams from which tackles were suspended as required. It weighed about 40 tons and handled most of the members directly from boats in the river below. The 15-ton derricks on the top chords of new span 12 were used for lowering material for span 11 on to boats in the river; that is to say, the material for span 11 was run out over the bridge to a point between spans 12 and 11 and then lowered to boats, and again hoisted from the boats from the overhanging beams of the traveler used in erecting span 11. This method of delivery was necessary from the fact that material could not be gotten directly to the river nor could it be taken directly from the railroad tracks and put in place in span 11, as it was impracticable to hoist the material through old span 11 without excessive risk.

Old span 12 was taken apart by the traveler used for the erection of the new span, while new span 11 was being erected, but the falsework under new span 11 was left in position and the camber wedges were not driven out until the erection of the cantilever span was completed, thus securing additional solidity and freedom from vibrations. The dead load of this span was such that its moment was nearly three times that of the adjacent cantilever end of the channel span, therefore no counterweight was required for anchoring the latter.

The bottom chord of span 11 is a riveted member throughout, made with two built channels, latticed top and bottom. In the center panel, L5-L5, a special telescopic section 15 ft. 10 in. long over all is inserted to allow the last pin to be driven and the truss completely connected and swung when cambered above its final position so that the pins L5-L5 were several inches closer together than their normal position. The adjacent bottom chord sections L4-L5 project about 10½ ft. beyond the points L5 and have at their extremities holes L6 for 9-in. pins. In one piece these are round holes with a close fit, and in the other they are slotted to a length of 15 in. and are 9⅛ in. wide to make an easy erection fit. The pins in these holes engage round holes in the ends of the center section of the chord so that the latter is held fixed at one end and has 6-in. longitudinal movement at the other end. The slotted hole is located so that in erection the pin occupied the shore end and when the bridge was swung and the pin moved to the opposite end of the slot the distance between pins L5 and L5 was the required panel length and the member acts as an accurate tension member. The chord L5-L6 has a center vertical pin bearing diaphgram at L6 which is heavily reinforced and projects beyond its connection with the horizontal cover plate so as to clear the end of the center piece, L6-L6. The latter member is made with four webs between which the three webs of the adjacent piece are entered.

Erection of the channel span was commenced from the east end, at pier 10, where the hip joints of false work spans 10 and new span 11 were connected by three panels of eyebars put on the outside on extensions of the chord pins which were afterwards filled out with washers, and the end lower chord pins were connected by short pairs of struts enclosing the permanent lower chords, and engaging similar extensions of the pins. The trusses, portals, and top laterals were assembled complete to the center panel, as much of the sway bracing as possible was assembled and the floor beams were bolted to the vertical posts about 3 ft. below their final position so as to clear the floor of the old span. This was accomplished by placing the floor beams upside down and bolting them to the extended lower ends of the vertical posts which were cut off by pneumatic chippers after the old span had been removed and the floorbeams riveted in their permanent positions.

After the east half of the span was thus assembled the traveler proceeded to pier 11 and erected the west half in the same manner, the hip and end lower chord pins being connected respectively to eyebars and struts of a different character from those at the east end. As the trusses in new span 12 are 29½ ft. apart on centers and those of span 11 are 17 ft. apart on centers the eyebars and struts were connected directly to the pins of span 11 and at the opposite ends were connected to the ends of double-web horizontal plate girders. These girders cantilevered equally at each end beyond the trusses of span 11 and were connected to the latter so as to transmit the erection reactions without eccentricity. The eyebars were made without adjustment, but the struts were each made in two pieces separated by a vertical wedge with 8-in. adjustment, operated by a screw.

The connection between the lower chords of spans 11 and 12 was made with horizontal longitudinal struts consisting of two built channels with top and bottom flange tie plates. Each strut was made in two telescopic pieces. In one of them the channels were separated to form jaws clearing the end post and engaging the end lower chord pin of span 11 at one end and pin-connected at the other end to the other part of the strut, which was narrower and was partly enclosed in the first piece beyond which it projected to its connection with the cantilever girder through span 12. The wide member had, near the center, a short pair of intermediate webs or longitudinal diaphragms which received one of the pin-connected wedge-bearing castings. Beyond this there were two pin connections for the narrow member. One of them, near the center, received the pin, which also engaged the other wedge bearing and was slotted; the other at the end of the member, was bored to a close fit for a 6½-in. pin The narrow member engaged both these pins with reversed holes; that is, there was a slotted hole opposite the round hole and a round hole opposite the slotted hole in the wide member. The round hole in the end of the narrow member engaged the second wedge-bearing casting and held it fixed relative to that member. The slotted holes allowed the two members to move back and forth 9 in. Therefore when one end of the strut was fixed to span 11 and one end to span 12 the wedges were operated to separate their bearings, the length of the strut was increased and as span 12 was fixed and the end of span 11 was on rollers it was moved longitudinally to correspond. In both members the horizontal flange cover plates were bolted permanently in place and those of the narrow members were extended beyond the flanges so as to engage the flanges of the wide member and were bolted to them through slotted holes 5½ in. long.

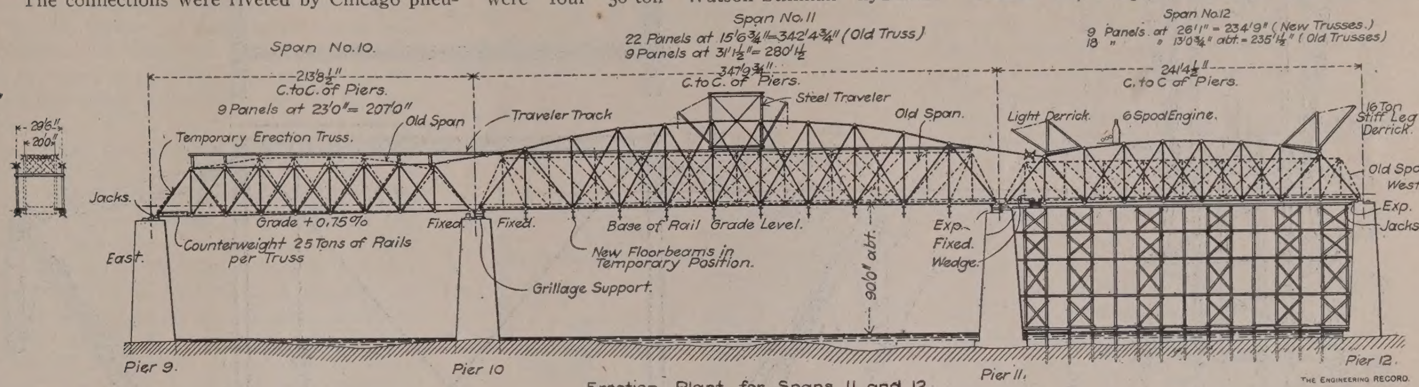
The transverse girder through span 12, for the lower chord conection was 32 ft. 3 in. long and 8 ft. wide and had two ⅜-in. webs 25¼ in. apart in the clear. Each web was made with two 48-in. plates spliced with a stiffening rib made with two 6 x 6 x ⅝-in. angles and two 12 x ½-in. plates. The lower chords of span 12 passed between the girder webs which also engaged and were field-riveted to the struts connecting with span 11. The upper transverse girder for the connection of the top chord ties to span 12 was similar to the one above described, but the webs were spaced only 21¼ in. apart and were connected by four pairs of transverse diaphragms, one pair on the center line of each truss of spans 11 and 12. The eyebars of the top chord ties passed between these pairs of diaphragms and were connected to them with 6½-in pins on opposite sides of the girder.

The east ends of the temporary trusses in span 10 were depressed 36 in. lower than the west ends by a pair of hydraulic jacks loaded 144,000 lb. for each truss. When the members of the center panels of the trusses in span 11 were assembled the bottom chords overlapped about 3 in. at the temperature of 40 degrees, and there was a clearance of about 9 in. between the ends of the top chords. A slotted hole was provided for the center lower chord pin to allow the connection to be made in the displaced positions of the members and permit the members to gain their permanent positions afterwards. The east ends of the temporary anchor arm trusses were jacked up at pier 9 simultaneously with the withdrawal of the adjustment wedges at the west end of span 11, and members of the center panel assumed their calculated position and were connected and the span was swung without the use of jacks that had been provided to raise the west end of span 12, if necessary. The maximum tension stresses in the old bridge did not exceed 16,000 lb. per sq. in., and those in the temporary anchor trusses, span 10, did not exceed 20,000 lb. per sq. in. of the web members.

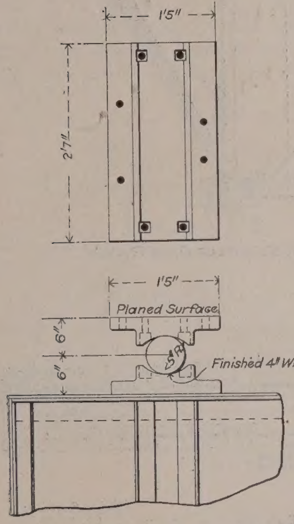
After the new span 11 was swung, its stringers were temporarily connected to the floorbeams about 3½ ft. below their final position, and the old floor and trusses were blocked up on them so that the new span sustained the traffic and the weight of the old span after the latter was disconnected, and while it was being removed by the traveler with which the new span had been erected. During this operation the stringers were braced by 6 x 12-in. zigzag pieces bolted to their flanges and the end panels of lower laterals were assembled and permanently connected. In order to clear these the end panels of stringers were suspended from the adjacent ones by yokes made with horizontal timbers and pairs of vertical screw rods. After the old span was removed the new floor was taken out, panel by panel, in intervals between trains, and replaced without breaking the continuity of the lower lateral bracing, by the floorbeams and stringers in their permanent positions.

The connections were riveted by Chicago pneumatic hammers operated with compressed air from an Ingersoll-Sergeant air compressor located on shore during the erection of both spans. The hoisting engines used for the travelers and derricks included four four and six-spool Lidgerwood, Mundy and Lambert machines. There were four 50-ton Watson-Stillman hydraulic jacks. The wedge adjustment at pier 11 was a device kept in stock for cantilever erection, and most of the other plant was either of standard make or special patterns developed by the contractors.

Erection calculations were very carefully worked out, complete drawings were made and

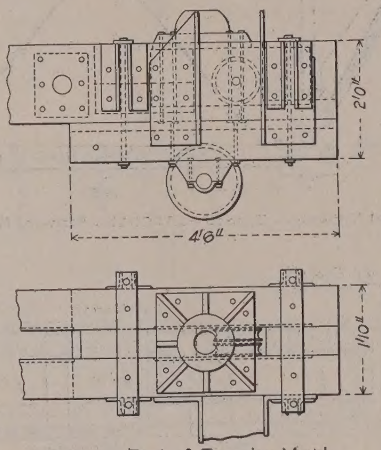

Span No.10.
Span No.11
22 Panels at 15'6¾"=342'4¾" (Old Truss)
9 Panels at 31'1½"= 280'1½
Span No.12
9 Panels at 26'1" = 234'9" (New Trusses.)
18 " " 13'0¾" abt.= 235'1½" (Old Trusses)
213'8½" C.to C. of Piers.
347'9¾" C.to C. of Piers.
241'4½" C. to C of Piers.
9 Panels at 23'0"= 207'0"
29'6"
20'0"
Old Span
Traveler Track
Steel Traveler
Old Span.
Light Derrick.
6 Spool Engine.
16 Ton Stiff Leg Derrick.
Temporary Erection Truss.
Old Span. West.
Jacks.
Grade +0.75%
Fixed
Fixed.
Base of Rail Grade Level.
Exp.
Fixed.
Wedge.
Exp.
Jacks.
East.
Counterweight 25 Tons of Rails per Truss
New Floorbeams in Temporary Position.
Grillage Support.
90'0" abt.
Pier 9.
Pier 10
Pier 11.
Pier 12.
THE ENGINEERING RECORD.

Erection Plant for Spans 11 and 12.



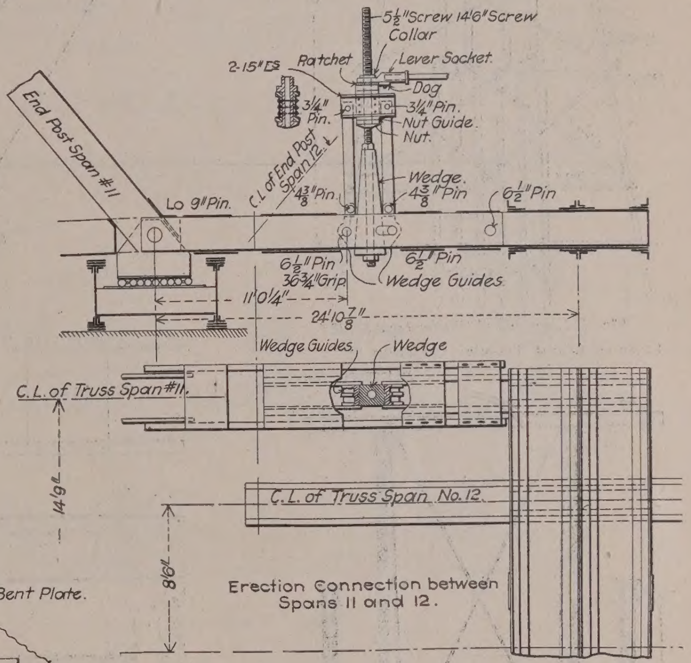
Bearing for Erection Truss.

THE ENGINEERING RECORD.

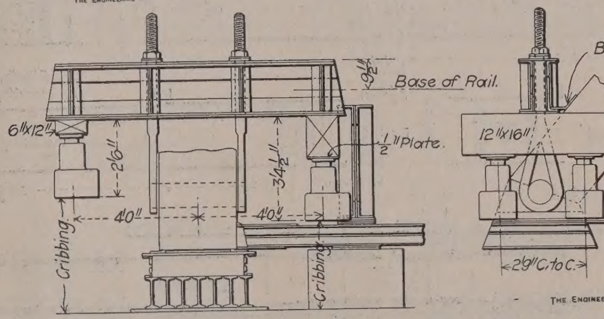


Details at Foot of Traveler Mast.

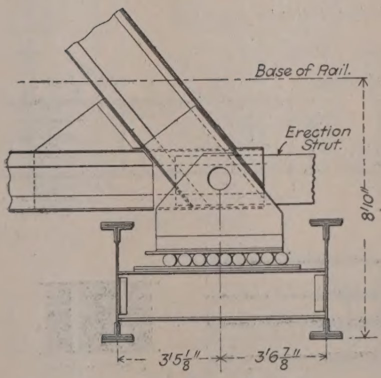
THE ENGINEERING RECORD.



Erection Connection between Spans 11 and 12.

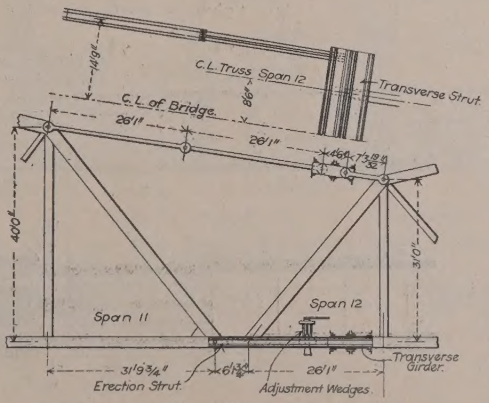


Apparatus Provided for Lifting West End of Span 12
Maximum Load 200,000 Pounds per Truss.



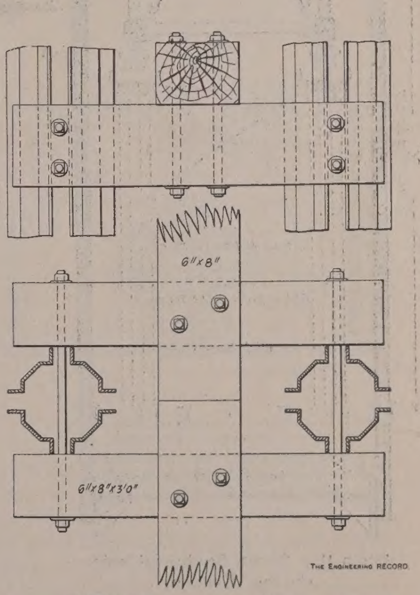
West End, Span 11.
Expansion Shoe on Pier Grillage.

THE ENGINEERING RECORD.



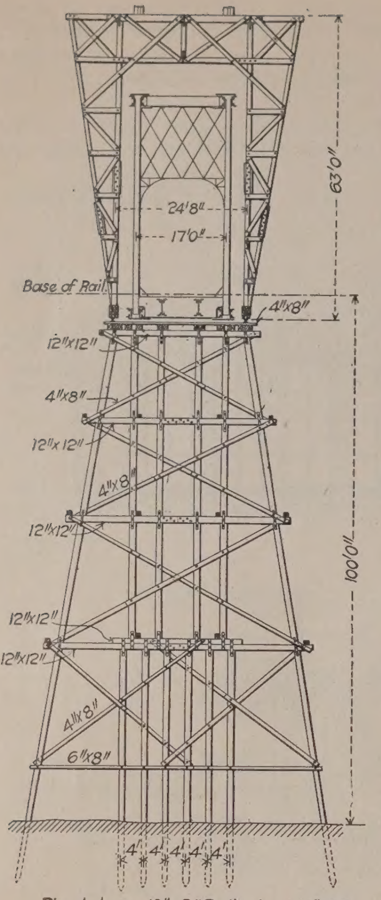
Temporary Connection between Spans 11 and 12.

THE ENGINEERING RECORD.



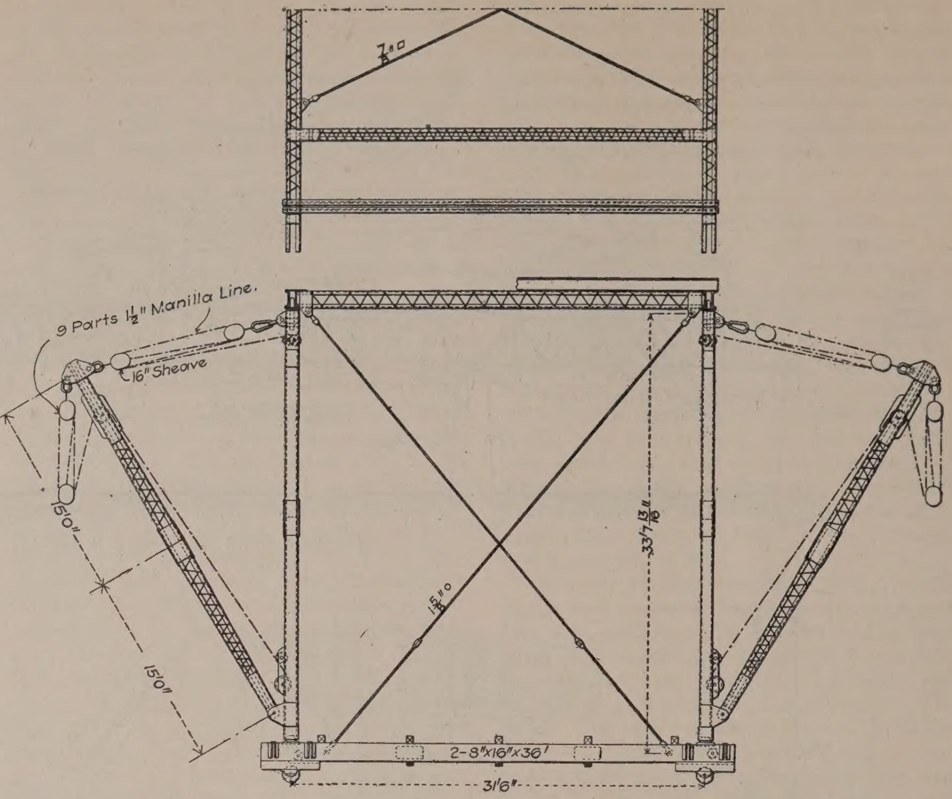
Temporary Bracing between Vertical Posts of Old Trusses.

ANCHOR SPANS 11 AND 12, AND DETAILS OF ERECTION PLANT FOR SPAN 11, BENWOOD BRIDGE.

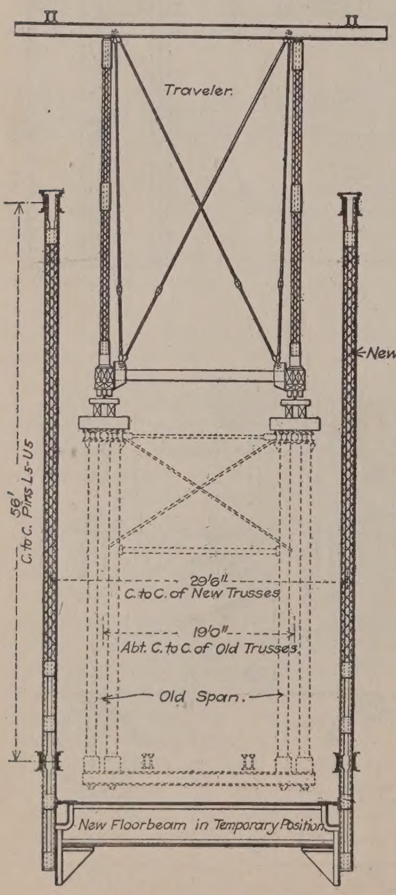


Plumb Legs 12"x12" Batter Legs 12"x12"
Falsework and Traveler for Span 12

THE ENGINEERING RECORD.

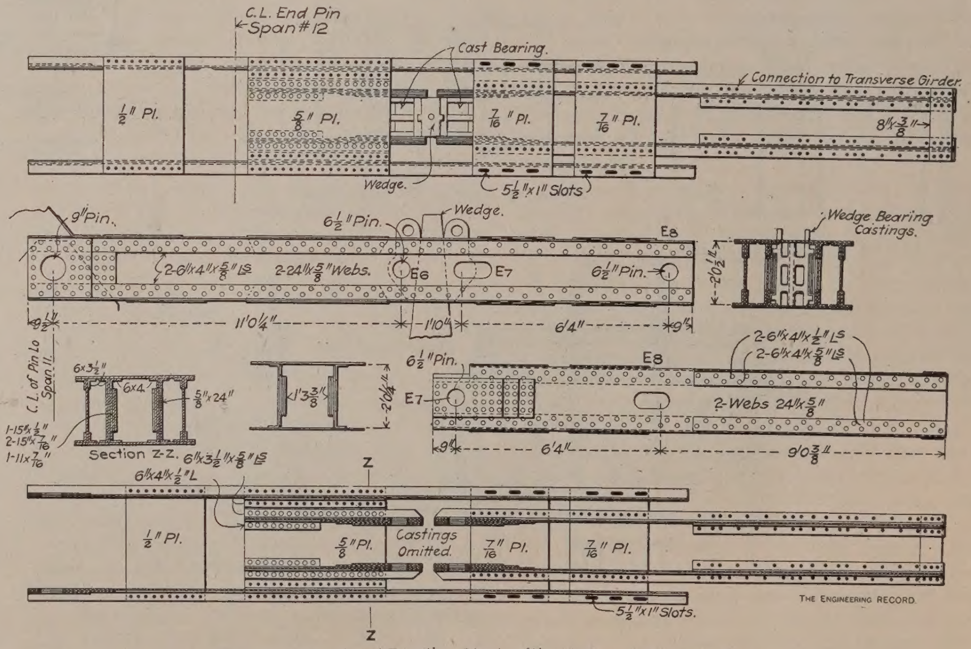


Steel Traveler. Capacity 23,000 Lbs Forward Reach, 26,000 Lbs. Side Reach.


Traveler.
New Span.
56' C. to C. Pins L5-U5
29'6" C. to C. of New Trusses
19'0" Abt. C. to C. of Old Trusses
Old Span.
New Floorbeam in Temporary Position.

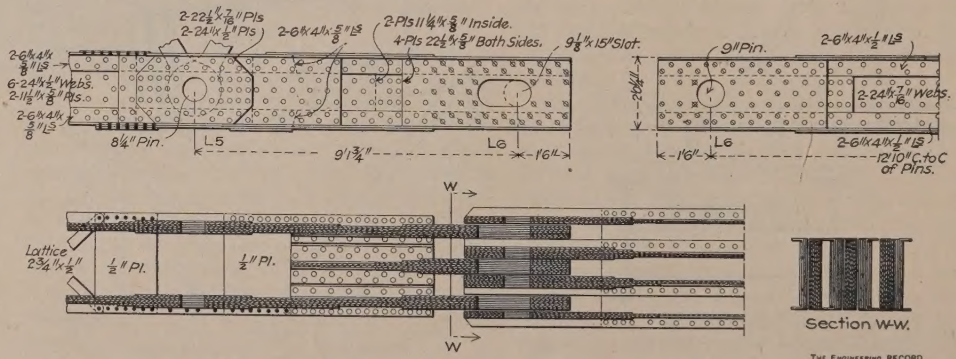
Span 11 - Cross Section at Center during Erection.

THE ENGINEERING RECORD.



THE ENGINEERING RECORD.

End Lower Chord Erection Strut with Wedge Adjustment.



THE ENGINEERING RECORD.

Adjustable Center Panel of Bottom Chord.

TRAVELER AND TELESCOPIC MEMBERS FOR ERECTING SPAN 11 AND FALSEWORK FOR SPAN 12, BENWOOD BRIDGE.

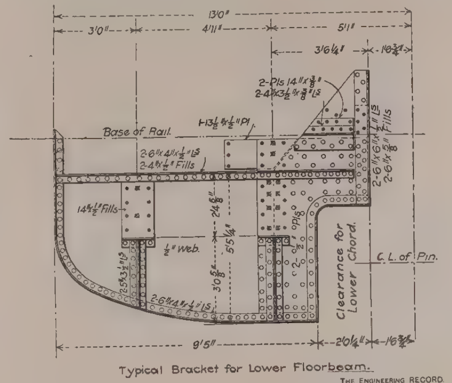
instructions issued to the foreman before erection was commenced. These were accurately carried out and no difference arose between the calculated and actual results. Accurate profiles were made of the panel points of both trusses of old span 11 and a set of diagrams was prepared showing the successive positions of the traveler and the pins driven as each truss member was assembled. The principal distances and levels were calculated and accuracy was insured by continually measuring and checking these as the work progressed.

The bridge was designed and the system of erection followed was adopted by Mr. J. E. Greiner, engineer of bridges and buildings of the Baltimore & Ohio Railroad Co. The 380-ton span 12 and the 730-ton span 11 were built at the Edgemoor plant of the American Bridge Co., of New Jersey, Mr. Paul L. Wolfel, chief engineer, and the work was erected by the American Bridge Co. of New York, Mr. S. P. Mitchell, chief engineer, and Mr. H. F. Lofland, manager of the eastern division. Work was commenced on the falsework for span 12 in the fall of 1903, and the erection of span 11 was completed in April, 1904. An average force of about 40 men worked 34 days in erecting new span 11 and removing old span 11.

OILING MACADAM ROADS has been tried for several years in Liverpool, and the experiments are stated to point to eventual success with some classes of oil. As yet, however, the experiments have not been conducted on a sufficiently large scale to furnish definite information, as in many cases a considerable amount of mud and dust reaches the oil-treated surfaces from side streets.

Details of Blackwells Island Bridge Superstructure.—III.

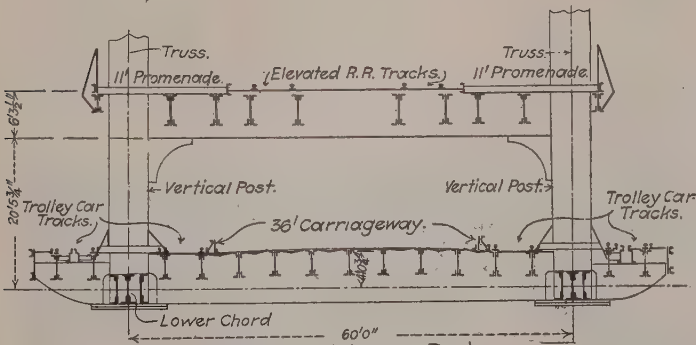
Floor Platforms.—Traffic is carried across Blackwells Island bridge on two decks which are substantially alike in all five spans. They are parallel throughout, being horizontal in the island span and sloping both down from the ends of the span to the approaches. The decks are 15 ft. apart in the clear and the lowest one has a maximum height of 135 ft. above high water. The lower deck is 90 ft. wide over all and is supported on plate girder floorbeams about 6 ft. deep and 56½ ft. long over all between the trusses, 60 ft. apart on centers, and on their cantilever extensions from about 10½ to 11½ ft. long, all of which are field-riveted through vertical connection angles to the vertical truss members at panel and sub-panel points from 20½ to 40 ft. apart. The main floorbeams weigh from 30,000 lb. to 36,000 lb. each, and are riveted up complete at the bridge shops and shipped whole to the site. The web is reinforced at the ends and extends above the top flange for the post connection and is notched on the lower side to clear the lower chord. The cantilever brackets or extensions are of corresponding construction and are connected to the main floorbeams by pairs of 14 x ½-in. horizontal tension bars riveted to their extended web plates and to and across the vertical posts, and by pairs of 7 x 3½ x ½-in. angles field-riveted across the bottom flanges of the lower chords and to the floorbeam flanges to take the 56,000-lb. flange stresses.



Typical Bracket for Lower Floorbeam.

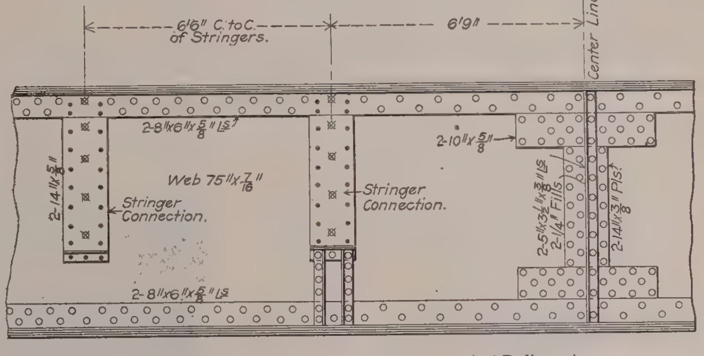
THE ENGINEERING RECORD.

There are fifteen lines of stringers from 30 in. to 42 in. deep which are seated on reinforced shelf-angles and are web-connected to the floorbeams with twelve field rivets through filler plates countersunk riveted to the floorbeam webs at the shops. Four lines of electric street car tracks will be laid on eight lines of the stringers and the other stringers will at first all carry the 36-ft. roadway, but provision is made to utilize four more of them to carry two additional street-car tracks if necessary. All of the stringers except those carrying the car tracks have ⅜-in. buckle plates riveted to their top flanges to carry the paved floor. The plates are stamped in sheets ½ panel long and 4½ ft. wide, with a 3-in. downward concavity, and are levelled up with concrete 2 in. in minimum depth and paved with 4-in. creo-resinated wood



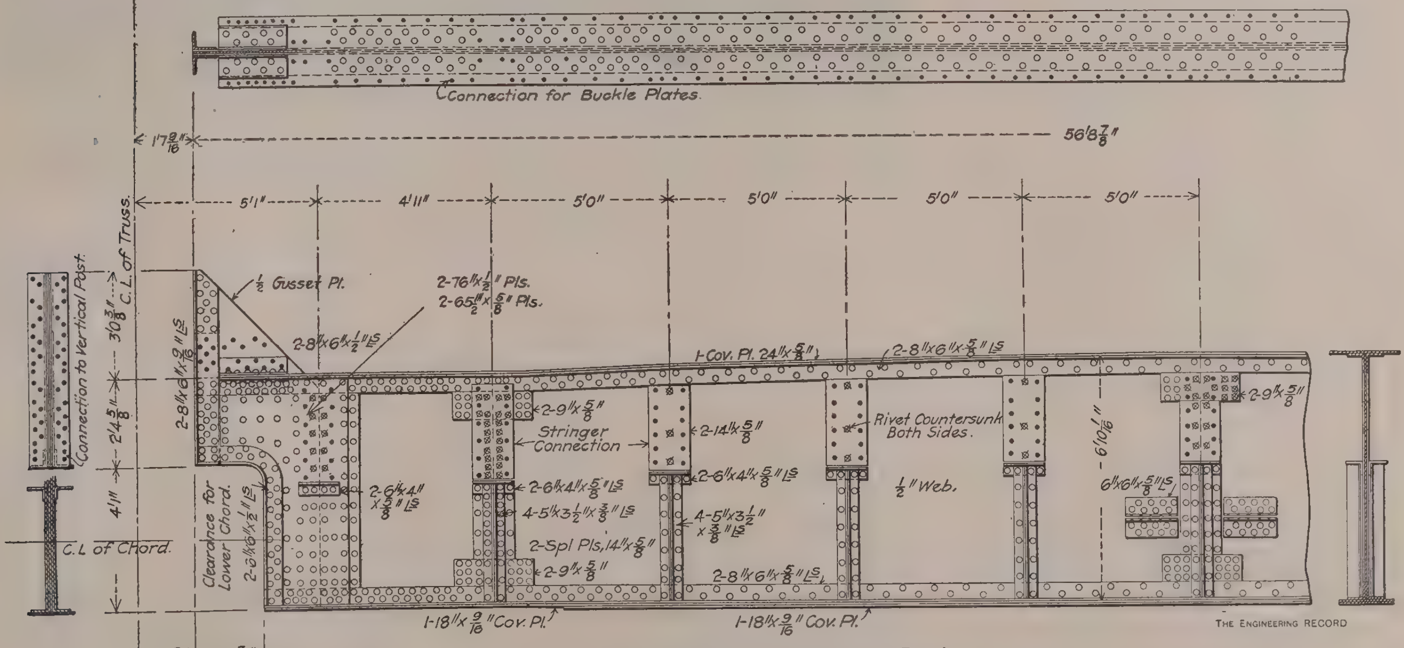
Upper and Lower Decks.

THE ENGINEERING RECORD.



Upper Deck Floorbeam for Elevated Railroad.

THE ENGINEERING RECORD.



Typical Floorbeam for Lower Deck

Upper and Lower Floor Beams, Blackwell's Island Bridge-

blocks. The stringers outside the trusses support intermediate transverse beams which carry one line of intermediate stringers outside the car track. The ends of the cantilever beams are connected by fascia girders 39 in. deep with single 6-in. channels riveted to the upper and lower edges of the web on the outside to make ornamental flanges.

The upper deck floorbeams are about 55 ft. long and 6¼ ft. deep and are of simple plate-girder construction, corresponding throughout to the middle part of the floorbeam shown in elevation. The ends of webs are reinforced by two ⅝-in. and two 7/16-in. plates, giving it a total thickness of 2 9/16-in., so as to resist the erection shears from the 780-ton traveler. The two ⅝-in. plates are extended to make fillers under the ends of the outside stringers which, like those nearest the center line, are seated on horizontal shelf angles with their outstanding flanges supported on pairs of vertical distribution angles.

The other stringers have merely for convenience in erection, horizontal connection angles without reinforcement under their ends. The pair of stringers under each elevated railroad track and the adjacent pairs under the sidewalks, are braced together by the usual transverse frames and by diagonal lateral angles. The sidewalk stringers carry 7-in. transverse I-beams 3½ ft. apart, which cantilever about 3 ft. beyond the truss centers and have their outer ends connected by fascia girders. They will probably support concrete floor slabs.

The trusses are proportioned for a working load of 8,000 lb. per lin. ft. of bridge and for a congested load of 16,000 lb. The floors are proportioned for the following loads: on the each elevated railroad track, 52 tons on four axles 2 ft. plus 10 ft. plus 6 ft. apart, for the motor ends of two cars; on each street car track 26 tons on two axles 10 ft. apart or 1,800 lb. per lin. ft. of track; on any part of the carriageway 24 tons on two axles 10 ft. apart and 5 ft. gauge, occupying a space 12 ft. wide and 30 ft. long, plus 100 lb. per square ft. on the remainder of the floor surface; on the footwalks, 100 lb. per sq. ft.

The floorbeams in the carriageway and sidewalks are proportioned for maximum unit stresses of 15,000 lb. in the tension flanges, 10,000 lb. shear on shop-rivets, bolts and web plate net section and 20,000 lb. shop-rivet and bolt bearing. One-eighth of the gross areas of the plate-girder webs are considered available as flange areas. All field rivet holes are sub-punched and reamed with twist drills through iron templates or while the members are assembled together.

The lower lateral system consists of a double intersection set of X-bracing with the diagonal members of I-shape cross section made with two pairs of angles back to back, latticed. The ends of these members are field-riveted between horizontal jaw plates in the planes of the bottom flanges of the lower chords at panel points and connected to the floorbeam webs on the upper sides of the struts. The struts intersect the intermediate floorbeams at their centers where they are field-riveted between a continuous horizontal connection plate across the bottom flange of the floorbeam and a pair of plates on opposite sides of the web above, thus transferring the stresses directly to the lower chords without inducing any stresses in the floorbeams.

The floor system is designed on the assumption that the elevated railroad tracks will weigh 400 lb. each per lin. ft., that the upper promenade pavement will weigh 20 lb. per square ft. and that the carriageway concrete foundation and pavement will weigh, respectively, 40 and 20 lb. per square ft. On these assumptions the weights of the floor systems per truss at panel points vary as follows: at the main piers, L 57, paving 68,000 lb.; buckle-plates, guard-rails, etc., 76,000 lb.; stringers, fascias and I-beams, 95,600 lb., and floorbeams and brackets, 37,900 lb. At the middle of the island span, at L 65, paving, 54,400 lb.; buckle-plates, guard-rails, etc., 60,800 lb.; stringers, fascias and I-beams, 64,700 lb.; floorbeams and brackets, 35,900 lb.

The street car tracks have T-rails of the Am. Soc. C. E. standard pattern, laid directly on the stringers flanges and the spaces between them are covered with a continuous platform of narrow longitudinal wooden strips 1½ in. apart in the clear, supported on transverse angles about 1 ft. apart. The promenades and carriageway are enclosed with railings made with three lines of 3-in. and 3½-in. gas pipes with the panels between them filled with riveted steel lattice. The outside promenade posts are of cast iron with wide solid webs, all others are of regular gas pipe with cast-iron pedestals.

The bridge has been designed and its construction directed by the Department of Bridges of Greater New York, Mr. George E. Best commissioner, Mr. O. F. Nichols chief engineer, Mr. R. S. Buck consulting engineer. The contract for the superstructure has been awarded to the Pennsylvania Steel Co. Mr. J. V. W. Reynders, superintendent of the bridge and construction department.

Failure of Wrought Iron Water Pipe Through Corrosion.

By Frank N. Speller.

A portion of this line which had been in service only one year began to leak and show signs of active corrosion on the inside. This was 3-in. extra strong pipe, and as iron had been in use in this mill for fifteen years with water from the same source with no trouble, it was inferred at first that the failure was due to soft steel pipe having been used on this particular line; however, analyses of the portion which gave out showed it to be wrought iron. The unusual circumstance led the writer, on hearing of the case, to examine the conditions more closely.

Example of Corrosion of Iron Tube by Polluted Water.

The sections corroded were laid horizontally at the top of the system. When opened up, the pitting was found to be confined to a strip of the upper interior surface of the pipe less than 2 in. wide. A photograph of a half section of a corroded portion of the pipe is reproduced; it will be seen that toward the sides no unusual corrosion took place (the same being true of the lower half of this section), while at the top the pits extend almost or completely through. [The photograph was too indistinct to be engraved as it was taken, and was retouched to show the pitting properly.—Ed.]

The water, while apparently still good looking, appears to have been contaminated by increased amounts of sewage during the past few years. The interior of the pipe showed distinctly in places a glutinous skin of decomposing organic matter. Analyses of the pipe gave:

Samples from	Outside.	Pitted Surface.	Outside Opp. pits.
Silicon	0.19	0.13	0.090
Sulphur	0.018	0.015	0.029
Phosphorus	0.280	0.274	0.275
Manganese	Trace	Trace	Trace
Carbon	Trace	Trace	Trace

The material is evidently wrought iron of average grade. An analysis of the residue scraped from the corroded portion showed the bulk of this to be oxide of iron with some organic matter, considerable combined CO_2, and 0.68 per cent. sulphur; about 0.15 per cent. sulphur was combined as ferrous sulphate.

The data collected appear to point to decomposing sewage matter as the origin of the trouble. The H_2S and CO_2 produced, probably mixed with a certain amount of air, collected in this trapped portion of the system and corroded the iron very quickly. Somewhat similar conditions were observed in a natural gas line where the gas carried 2 per cent. H_2S. Some water on the bottom of the pipe kept that portion partially protected, while the damp gas above corroded the pipe seriously; sulphide and sulphate of iron formed a large part of the rust in this case.

The above is one of those cases where a slight change of conditions has accelerated the corrosion beyond all proportion. It will be noted that the corrosion is not at all uniform, as many believe will be the case with wrought iron. On the contrary, the pitting is deep, while some adjoining parts of the metal are intact. If the corrosion had been at all regular on the section affected the pipe would probably have lasted much longer.

For a short period iron presents a better appearance under corrosion, owing to a concentration of cinder near the surface. In the case of pipe, experience has shown this initial protection to be misleading, as once the corrosion gains a start the relative losses are practically equal under most conditions. It would therefore seem that environment is the determining factor in corrosion, compared with which any difference there may be between the relative tendencies of wrought iron and soft steel to rust is usually trivial.

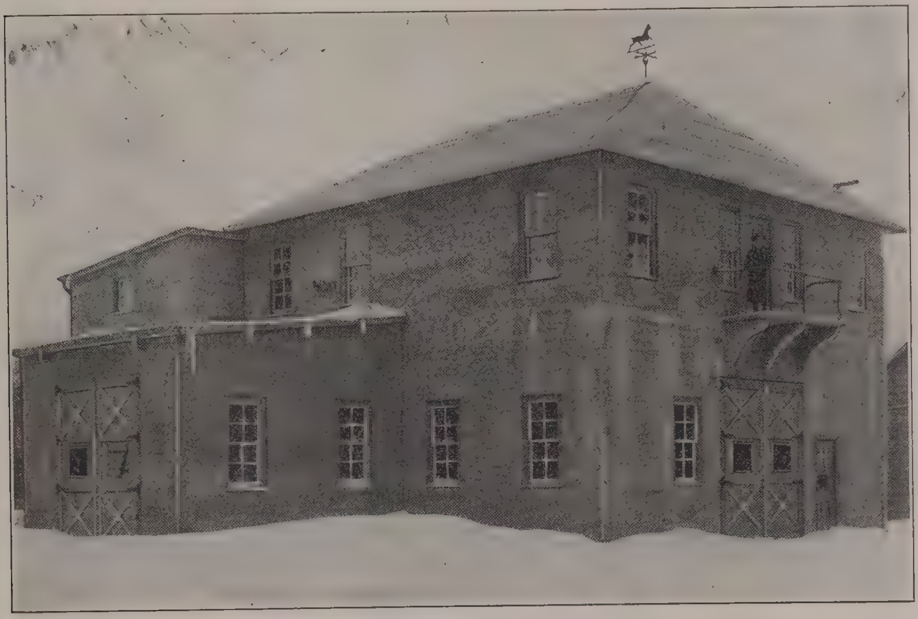
THE USEFULNESS OF THE CAMERA on engineering works was discussed a few months ago in these pages, and that article may be supplemented by a few notes on the experience of the Boston Elevated Ry. with this apparatus. This company has long maintained a photographic department under the charge of Mr. P. W. Rowell, who has had an engineering training and is therefore able to take views more intelligently than a photographer without such knowledge. Both 8 x 10 and 11 x 14 in. negatives are taken and the company now has nearly 4,000 of them. Blue-prints from them are classified in albums, as solio prints do not stand handling so well. The department also reduces maps and drawings by photographic methods to small sizes for convenient reference. The expense of the department has been more than saved by the value of the photographs in suits to which the company is a party. Although the views are primarily for engineering purposes, and are used by the staff constantly, some new use of them arises frequently. The policy has been to take progress pictures everywhere, to err on the side of too many rather than too few. Each negative has the date when it was made placed on it, and this practice has frequently proved decisive in legal proceedings.

A Reinforced Concrete Stable.

The stable erected by the Bell Engineering & Construction Co. for its president, Mr. Bell, on his place at Scarsdale, N. Y., was begun early last September and was finished in the late fall. It was designed on purely utilitarian lines with little or no attempt at extra decoration, more attention being paid to the interior. From one side only and that from the back, is it visible at any distance, as it stands in a thick grove of pines. The design was changed once or twice during the course of construction, which somewhat delayed the work, and slightly increased the cost.

Except in the case of the roof and in two other places, the material is entirely reinforced concrete of varying mixtures and methods of reinforcing throughout. No rigid rule of design was followed as it was desired in this case to make certain experiments and investigations that could be used in the future in such buildings.

The ground plan of the stable is roughly that of a Greek cross. The center and one arm constitute the coach house, and two side arms are formed respectively by the washstand on one side and the cleaning and harness room on the other side. The remaining arm is formed by the horse stable. The part occupied by the coach house and stable is two stories high, the rest is one story high.



Reinforced Concrete Stable at Scarsdale, N. Y.

The coach house is 35x35 ft. and 16 ft. high in the clear. The second story is 10 ft. in the clear and there is a steep hip roof over this. There would be room for a loft under this roof at any time it should be desired, and in fact the tank supplying the water is there now.

The wash stand is 16x18 ft., interior dimensions, and the cleaning room and harness room 18x20 ft. The stable is 18x41 ft. and contains five stalls and a box. The harness and cleaning rooms are separated merely by a light partition. The object of this plan is the isolation of the horses from the rest of the establishment. When it is necessary to drive out, the horses are taken from the stable and walked into the coach house, where they are put in. They are then driven out through the front door of the stable, which is at the other end of the coach house from the door into the stable. On their return they are driven into the door of the wash stand where they are unharnessed, the harness being taken at once to the cleaning room; the horses will go to their stalls and the carriage, remaining in the wash stand, is washed down by means of a hose suspended to a revolving arm in the ceiling. This saves wear on the hose, besides giving the cleaner absolute access to all parts of the harness without kinking the hose or shutting off the supply of water. When the carriage is cleaned it is rolled to its place in the carriage house floor, and should it be desirable to take it to the upstairs coach-house room, it can be rolled to an elevator at the door of the wash stand in the corner of the coach house. This elevator has been provided for in the design, but has not yet been installed. This design avoids the necessity of bringing dirty harness into the harness room, or having the horses in the coach house any longer than necessary; or bringing dirty vehicles over any part of the coach-house floor.

The stalls drain back to a gutter, running the entire length of the stable, which drops in the middle. The cleaning room drains to the center of a hard concrete floor and the wash stand drains to a trap a little to one side of the center. The space back of the stalls and a strip leading from the wash stand to the door of the stable and thence down the center of the coach house to the front door is paved with wood blocks manufactured by the U. S. Wood Preserving Co., over which beach sand is freely swept. The rest of the coach house and harness room is paved with hard polished wood.

On the second floor over the coach house there is a large space adjoining the elevator shaft where vehicles can be stored. The front of the coach house is occupied by the coachman's quarters, consisting of three rooms, the middle one opening out on a balcony supported on concrete brackets and enclosed by a pipe railing. On this floor is a bath room and the heating apparatus for the hot water that washes the harness and for toilet purposes.

Over the stable is a high loft connected by a narrow door to the second story of the coach house, also opening out on the other side with a large door surmounted by projecting I beams whereby the feed is hoisted in. There is a window at either end. In one corner is a trap door leading to a vertical iron ladder to the stable beneath; also the bran and oats bin are connected by means of two galvanized iron chutes to the feed boxes below. The horse mangers are filled by hand.

Beneath the stable roof, the entire length from the front of the coach house to the back of the stable is a cellar 20 ft. wide. In one part of the cellar is coal which is shot in from a chute under the stable and in another part is the boiler of the hot water heating plant and a Rumsey electric pump which furnishes water to the tank either automatically when the supply in it is low, or at will. This cellar can be reached from the coach house by a ladder under a trap or by steps from without.

The ceiling of the stable and the roof of the feed room and also the roof of the wash stand and harness room are of reinforced concrete of ribbed construction, the reinforcing metal being of commercial steel of square cross-section. On account of the plan of the coach house being of a large span, to lessen the size of the girders and to save carpentry work, it was found cheaper to use three 20 in. steel girders, but the subordinate members are of reinforced concrete.

The floor was made extremely strong to permit the heaviest kinds of motor cars being rolled out from the elevator without fear of the shock doing any damage and for storing carriages when knocked down.

The roof of the cellar was made with I beams of 6 ft. centers with reinforcing of small iron rods. The roof of the cellar was designed especially to meet the shock of horses tramping around on it and heavy vehicles such as coaches being wheeled about.

The roof over the main part of the building is a light steel sloping roof erected in place by the Hinkle Iron Co. It was first thought a concrete roof should be put in, but afterwards it was decided to put on a light green tile roof so that the whole tone of the building would be a light green and white. On this steel form, book tile were placed and covered with Paroid paper. On this book tile light shingle tile are to be laid.

The walls of this stable are simply curtain walls between pillars supporting the building erected monolithically It was originally intended to form a double wall by filling in the bays between the pillars with tiling; but this, however, was not done and the walls were weather-proofed on the outside after a thorough grouting. So far, after a hard winter, no trouble either from dampness or loss of heat has been experienced, nor has there been any sickness among the horses nor deterioration in the vehicles.

The concrete itself was a mixture of ½ in. crushed bluestone, Vulcanite cement and sharp sand. The chimney and part of the foundations, steps, roofs and walls of the feed room are all of gravel concrete. No cinder concrete was used in any part of the building.

The harness room is lined throughout with hard pine highly polished and the coachman's rooms are partitioned with wood used originally for the forms. In fact all of the wood excepting the fine finish used in this building had been employed in the forms. This includes all of the partitions in the coachman's rooms, wood for the feed boxes, etc. There was not very much new wood left from the forms, as practically all of the material was old boards and studding from an old stable on the place.

The water for the stable is furnished from a well near by, by the means of the pumping system before described, and the lighting throughout is by electricity. The coach house is lighted by two clusters set in the ceiling and several side lights in various parts. The hay loft is not lighted but can be illuminated by means of a covered electric light carried in the hand by a device which enables the wire to uncoil or roll up as the case may be. The stairs of the coach house are of wood and are merely temporary, as it is intended to erect an iron stairway. The heating is a hot water system installed by the Sayles Co. The owner of the stable is well satisfied with it and intends that all subsequent buildings on the place shall be of reinforced concrete.

Gas-Producer Power Plants.

At the last annual meeting of the American Institute of Mining Engineers, Mr. Samuel S. Wyer, of Columbus, O., read a paper on gas-producer power plants, which is an interesting summary of the state of the subject by an engineer who anticipates a widespread use of such apparatus. This paper forms part of a very complete work entitled "Gas-Producers," which will be published by the Engineering & Mining Journal Co. The author attributes the fact that gas-producer power plants have received so little attention in America to five conditions: First, ignorance and prejudice; second, newness of work; third, inadaptability of gas engines; fourth, fuel economy not imperative; fifth, smoke nuisance not given attention. These conditions Mr. Wyer discusses as follows:

The only literature pertaining to gas-producer power plants is that found in the various technical journals and in the transactions of engineering and other technical societies. In many cases the papers are of a fragmentary character, and seldom are they complete or comprehensive. It may be that the lack of reliable data available to engineers is the cause of the ignorance and prejudice that exists concerning this important branch of engineering.

The manufacture of producer-gas is an old process, and gas engines have been developed to a very high stage of mechanical efficiency, hence there is no valid reason why such installations should be regarded as experimental.

No gas-producer power plant can be successful unless the gas engine is adapted to suit the particular gas available for its use. On the authority of Westinghouse, Church, Kerr & Co. an engine, which will develop 100 h.p. with natural gas, will give only about 80 h.p. with producer-gas—a loss of 20 per cent. With a 200-h.p. engine, this loss would be about 15 per cent. and with sizes above 300 h.p. it would be about 10 per cent. Hence, the obvious necessity of designing the engine to suit for the particular fuel it is to use. Several failures have been made by neglecting this important point.

Most of the large plants in America are in remote regions where the cost of fuel is high, hence the high economy of the gas-producer plant was necessarily a feature that commended itself.

The laxity of the laws regarding the smoke nuisance has not made it imperative for manufacturers to give attention to the prevention of smoke. As soon as regulations concerning the smoke nuisance are enforced, the gas-producer industry will receive a new impetus on account of the easy solution that the gas-producer plant offers for this trouble.

The following data relative to the design, operation and maintenance of gas-producer plants are given to show their advantages.

A good gas-producer, from the very nature of its construction and operation, does not allow the smoke to escape into the atmosphere; hence the gas-producer itself presents a practical solution for the elimination of the smoke nuisance. The non-requirement of a chimney means a large saving in the first cost and in the maintenance of a power plant, and is an additional advantage in plants where the æsthetic features of the design are of importance, for instance, in the case of a municipal power plant.

The cost of labor required to operate a gas-producer plant is about the same as that required in a steam plant of similar size. However, during the time that a gas-producer plant is idle, it requires less attention than does a steam boiler. In the case of a municipal pumping station, the labor required to operate the producer-gas plant would be one-half that of a similar steam plant, the gas plant being operated as follows: The gas producers to use coal for supplying the gas to operate a three-cylinder vertical gas engines direct-connected to a triplex double-acting power pump. In this case the usual fire engine will be dispensed with, and, should a fire occur, the requisite pressure will be obtained by pumping directly into the system. For ordinary domestic supply, the pump will deliver the water into a water tower, from which the mains receive the supply as needed. In every case the maximum quantity of water required during a fire is much larger than the average domestic consumption; hence the pump must be designed for this maximum quantity. As a result, the working of the pump at its full capacity for 6 out of 24 hours would furnish enough water for the daily domestic consumption; the pump would usually be operated from 7 to 10 a. m. and from 3 to 6 p. m.

A gas holder of sufficient capacity to run the pump for 30 minutes is to be filled before the producers are closed down.

Compressed air is to be used to start the engine, which may be put into motion simply by moving a lever.

The engineer is to live adjacent to the plant so that when an alarm is sent in to the hose company, and simultaneously to the engineer's home and to the plant, it would be possible for the engineer to have the pump at work direct into the system by the time the fire company could reach the fire and make hose connections.

Snowsheds with Glance Cribs, near Glacier, B. C.

Since the gas holder would supply the engine until the producers could be started, the above scheme of operation eliminates the necessity of a night fireman and the keeping up of at least 70 lb. of steam pressure in a steam plant. A similar arrangement could be equally well adapted for fire purposes in connection with large industrial plants.

With regard to the skill required, a producer-gas power plant does not require any greater skilled labor than does a steam plant of similar size; however, in some cases, it may require time for men, trained to handle steam apparatus, to become accustomed to gas engines and gas producers.

Two well-known engineering concerns give the following data concerning cost of installation: "The cost of gas power plants, including gas generating plant and gas engines, up to 500 h.p., is about 25 per cent. higher than the cost of a steam plant of similar size. Large plants from 1,000 h.p. upwards, cost about the same as a first-class steam plant of similar size."

The cost of repairs on a gas-producer plant will not exceed that of a boiler plant.

In order that a gas-producer plant shall be commercially successful, it must be able to make, from a low-priced fuel, gas that is sufficiently clean for use in an engine. Bituminous slack is usually the lowest-priced fuel to be had; however, anthracite culm, or even wood, may be cheaper in some localities. In all cases the percentage of sulphur must be low if the gas is to be used in a gas engine. Frequently the use of a mechanically washed coal will be economical.

The only reliable way to remove tar and other hydrocarbons from gas made from soft coal is to have the producer so arranged that the gas comes in close contact with an incandescent mass of carbon. No mechanical means have yet been found to be successful, although several forms of centrifugal apparatus have been tried. For the removal of fine dust particles, however, centrifugal fans have proved very satisfactory.

The standby loss of heat is very small, being limited to radiation only; a gas producer is tightly closed during the time it is not making gas and the entrance of air is thereby prevented. This feature is a marked advantage over a steam boiler under similar conditions.

Even after a producer has been idle for several hours, it may be started and can be working at its full capacity within 15 minutes. A gas holder is generally used in connection with the producer, from which a supply of gas can be taken to start the gas engine instantly and keep it in operation until the gas producers are making gas.

A gas producer may be stopped instantly by simply shutting off the supply of air and steam.

The gas from the gas producer is quite uniform in composition, and as it usually passes first to a holder before reaching the gas engine, it becomes thoroughly diffused, thus insuring a still greater uniformity.

The thermal efficiency of gas producers is generally about 80 per cent. and in some cases it is even higher than this value.

It is much easier to use an automatic feeding device on a gas producer than on a steam boiler, because all producers are placed vertically and the fuel can be dropped into position by gravity. The use of an automatic feed always decreases labor and insures more uniformity in the composition of the gas produced.

The rate of gasification in a gas producer is relative to the character of the coal used. The best rate determined by experience is 12 lb. of coal per square foot of grate area per hour, although some makers have advised as high as 20 lb. of coal. Experience has also demonstrated that too rapid driving opens a wide door for the admission of adverse gasifying conditions.

The amount and frequency of poking a gas producer will depend on the nature of the fuel and the design of the producer. The mechanical agitation of the fuel bed (as in the Kitson and Fraser and Talbot producers) eliminates poking entirely. In using bituminous coals, the difficulties of clinker formations are augmented by the production of coke. The judicious use of a steam blast and automatic feeding will generally reduce poking to a minimum, and, in some cases, will eliminate it entirely. Hand poking is very laborious for the attendant and usually it will be shirked whenever possible. Gas will usually escape around the poke holes while the producer is being poked, which will vitiate the air in the producer room and also affects the regularity of the composition of the gas.

The calorific value of producer-gas varies from 125 to 150 B.t.u. per cubic foot.

The generation of one brake horse-power per hour with from 1 to 1.25 lb. of coal or 3 lb. of wood, is very common producer-gas power plant practice at the present time, and the gas contains at least 80 per cent. of the heat energy resident in the fuel.

A very important advantage of the producer-gas installation is that the gas does not condense or lose power on its way to the gas engine. On the contrary, the cooler the gas the better it is for the engine. With steam, the condensation is considerable.

It is easy to prevent leakage of gas from the piping, owing to the low pressure of the gas (about 2 in. of water); whereas, with steam. there is often much loss and inconvenience on this account.

By using isolated engines, a large saving in shafting may be made in many cases. It is not possible to do this in steam plants and still maintains a good economy.

The floor space required for gas holders, gas producers and auxiliary apparatus is about the same as that required in a steam plant; the holder, however, need not be placed adjacent to the producers, but at any other convenient place.

A gas producer plant is under much better control than the average steam plant, because in the gas producers the air supply rate of gasification as well as the fuel supply can be regulated more easily.

One of the most potent advantages of the gas-producer plant compared with the steam plant is the ability of the former to store the heat energy in a holder where it may be drawn upon for immediate use. In this way irregularities and fluctuations of load need not affect the regularity of the action of the gas producer. This condition means an economy of operation and convenience of use that are impossible with any steam plant.

Another important advantage of the gas producer power plant is that, in many cases, the gas may be used both for power and for metallurgical purposes, the same pipes being used to supply engines and furnaces.

In many cases it is a serious matter to secure a sufficient supply of water for a steam plant and sometimes, even with an adequate supply, the quality of the water is such that it is entirely unfit for use in a steam boiler. One of the most annoying difficulties of many steam plants is the trouble caused by the corrosion and subsequent cleansing of the boilers, together with the maintenance of feed-water purifiers.

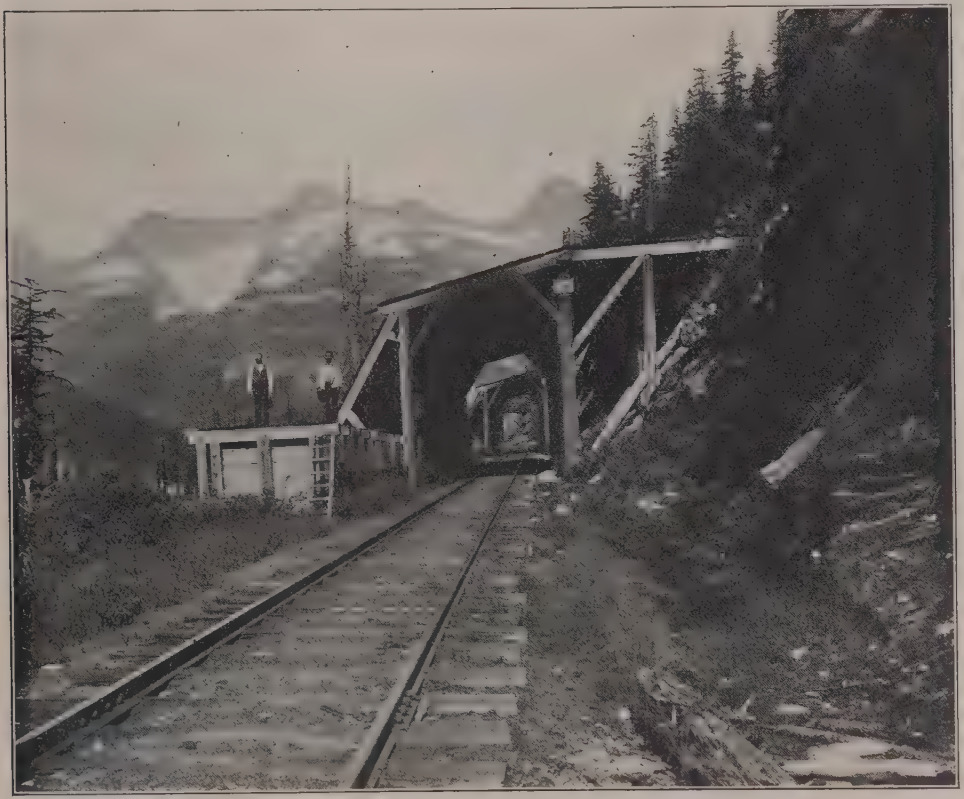
The gas producer power plant forms an almost ideal solution for the problem of water supply. With a producer in normal condition, the consumption of water will not exceed 2 lb. per brake horse-power. The water used in cooling the gases in the scrubber may be cooled in a simple tower and used repeatedly.

There is no difficulty in piping the gas for several thousand feet in order to reach an engine that drives an isolated machine; this often makes it possible to dispense with abnormal lengths of line shafting and the consequent friction loss, or other unsatisfactory methods of power transmission. This condition is especially valuable in places where electrical power is not used.

Standard gas producers now range from a few horse-power to more than 500 h.p. in size.

There is less danger of explosion in a gas producer plant than there is in connection with a steam plant; moreover, should an explosion occur, it would be much less violent and destructive than that of a steam boiler.

If desired, the gas producer plant may be placed near the fuel supply, which, in many cases, would reduce the expense of transportation, the gas being piped to the gas engines or furnaces where it is to be used. This arrangement, which is impossible with a steam plant, means a decided saving in favor of the gas producer installation.



Snowsheds on Loop of the Canadian Pacific Ry., near Glacier, B. C.

Snowsheds on the Canadian Pacific Railway.

The mountain divisions of the Canadian Pacific Ry. are subject to snowfall and snowslides often sufficient to bury deeply the track and cause very serious obstruction to traffic. In order to prevent this there have been constructed about 30,600 lin. ft. of timber sheds like those shown in the accompanying illustrations, which are proportioned to carry snow and ice accumulating on them to a depth of as much as 20 ft. These consist essentially of a roof and a downhill side wall built over the terraced cuts on which the single-track line is carried. About 8,600 lin. ft. of them are paralleled by uncovered track which is used in the summer-time.

They have a framework of timber bents from 5 to 8 ft. apart on centers, supporting a roof of longitudinal planks designed with a transverse pitch, calculated to be sufficient to drain rapidly the water from the melting snow and ice. Round timber cut in the vicinity was used for the old sheds, but new sheds and renewals are made with sawed timber. The vertical posts are usually seated on sills and are not braced longitudinally, except by the roof covering. The diagonal braces generally have the ends beveled in two directions and engage bearing pieces or angle blocks spiked to the vertical and horizontal timbers.

The sheds are of two types—namely, those composed of frame bents only and those having massive timber cribwork built into the face of the cut adjacent to the track in case there is liability of heavy lateral thrust. At intervals transverse wing walls or bulkheads, called glance cribs, are extended from the ends of the sheds to a considerable distance up the slope to divert the snow and prevent it from spilling over the ends of the sheds and obstructing the track at their entrances. The timber is generally cut in the vicinity of the sheds.

The sheds receive practically no maintenance except for renewals, and their average life is about 20 years, exclusive of the loss by fire, which is approximately 5 per cent. in that period. Failure generally begins through decay in the sills, cribs and the feet of the posts. No protection is provided against sparks from locomotives, but the sheds are furnished with pipe lines, hose, etc., which have been found efficient in extinguishing fires. The sheds are designed and maintained by the engineering department of the railway, Mr. W. F. Tye, chief engineer, and Mr. C. N. Monsarrat, engineer of bridges.

The Mutual Life Building in the City of Mexico.

The building which has just been completed in the city of Mexico for the Mutual Life Insurance Co., of New York, at a cost of $1,500,000, Mexican currency, is the pioneer modern office building in the Republic and is a great step in the architectural renaissance of the new Mexico, which is slowly rising from the picturesque but archaic old city of Spanish dominance.

The building covers the entire south front of the block on which the new Post Office is built, on the property opened by the demolition of the old National Theater, and the west elevation faces the site of the National Theater now under construction. The structure is not remarkable for its size when office buildings in the United States are taken as a standard, but it is most interesting for its monumental character, and the entire absence of artificiality of any kind of design or construction. The height of buildings in Mexico is regulated by municipal ordinance to about 90 ft., and the architects were given every opportunity by the owners to accomplish the design of a building of the most noble proportions.

The valley of Mexico is the bed of an old lake, and the subsoil consists of alluvial deposits from the erosion of ages on the neighboring extinct volcanoes. Well borings showed the soil to be very wet and soft mud and clay until a depth of seventy meters was reached, then a layer of pumice, some small strata of conglomerates and below this quicksand. A stratum of rock was found at a depth of about 240 meters, and below this water-bearing gravel from which the well in the building and others in the vicinity draw their supply. Water was expected at a depth of some two meters under the sidewalk, as in excavations made in previous years a great deal of water was found. Much to the surprise of the builders no difficulty was found with the water, although the soil was very soft. The operation of the comparatively new drainage system is assumed to be the cause of the receding water level.

The treacherous soil made it necessary to float the building on a mattrass of concrete and steel grillages, a solid raft 6 ft. thick and extending over the building area and under the sidewalks to the street. The grillage was formed of 150,000 pounds of steel and consists of 9 and 10-in. I-beams in sets of from six to fifteen, the inside columns having usually independent beds. The girders under the inside columns were formed of three 15-in. I-beams, and others of three 18-in. I-beams.

The front walls are self-supporting, and to carry the weight inside the building as much as possible, all the columns on this wall are 5 ft. 6 in. inside the building line. The grillage for the outside columns is continuous, formed of 6 and 9-in. I-beams spaced 1 ft. apart with pipe separators. Over these a continuous girder was laid made up of three 20-in. I-beams.

The rear walls are of brick and are supported by the steel from story to story, the columns being in the wall. On these walls the grillage was laid with the length normal to the wall line. A plate girder was used as a cantilever between two exterior columns, the other two (inside) columns forming the panel, being connected by a like girder laid over the other or free ends of the grillage.

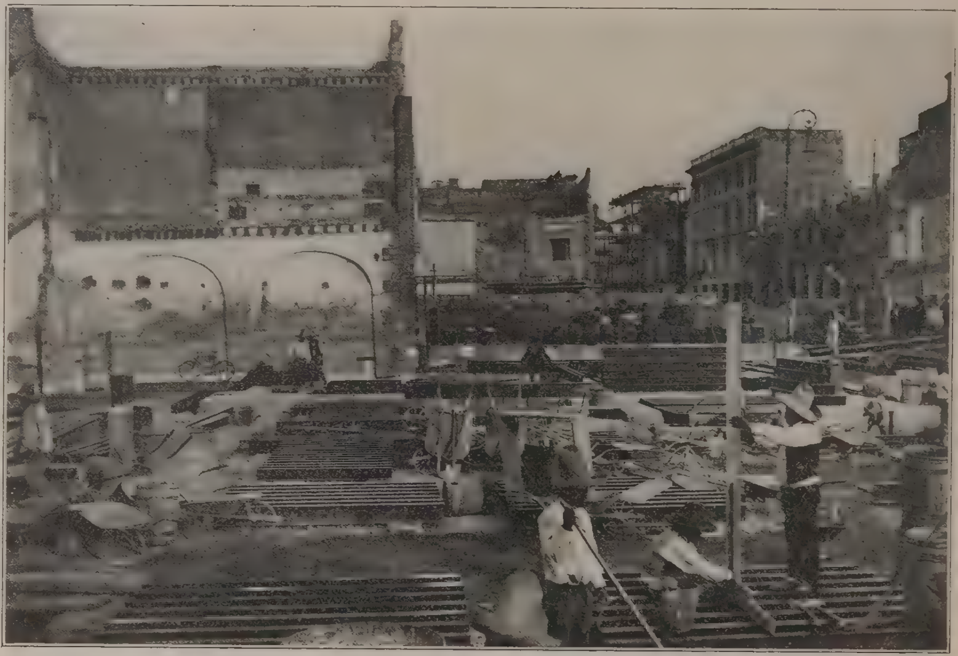
All grillage after laying was grouted in with Portland cement gravel concrete, and the girders bricked in. After a coat of waterproofing the whole surface was again covered with concrete formed of lava, from 6 to 12 in. thick, according to the grade of floor of basement.

All rivets were driven by automatic hammers; one portable yoke and four small hammers were used. This work, of course, was entirely new to the operators, and while there were many failures, on the whole it was much more economical and efficient than the usual method practiced in Mexico.

All street fronts are ashlar, of very dense and hard limestone, of a beautiful bluish white color, peculiarly nonporous. The stone came from a quarry on a mountain top, whence it had to be either packed or hauled in two wheel carts, 16 kilometers through two valleys, and over an elevation of 9,500 ft. above sea level, to the railroad station 75 kilometers from Mexico City. The roads were so bad that even in the dry season it required 18 mules and took two days to make the trip with some of the larger stone. In the rainy season little or no movement was possible. The force of the quarry were one year and three months quarrying the stone for the work, and the completion of the stone work was accomplished but a few days before the general completion was announced.

All partitions are of brick, and Roebling floor arches and ceilings were used.

The figured load on the foundations is 8,982 tons, the area of the building site 11,983 sq. ft., and the area covered by mattrass is 13,914 sq. ft., giving a load on the soil of 1,291 lb. per square foot.



View of Foundations of Mutual Life Building, Mexico, Nov. 4, 1903.

The contractors at the start of the stone work, in January, 1904, established several reference levels and benches, one on a recently constructed building and several in localities liable to be undisturbed, and as far from the work as it was practical to place them. On comparison at the completion of the work the whole settlement is found by the independent levels to be 5⅞ in. (the level on the other building giving evidence that that had settled about 1½ in.). At various times in the progress of the work the levels were run and they showed that the building was settling with the distribution of the weight. When the steel was complete and the rear walls in place the level showed the building to be down a little over one inch farther in the rear than in the front. When the west elevation was complete and the east not as yet above the third story, it was found that the west elevation had followed the rear, gradually shifting the point of extreme settlement toward this elevation. However, at the close, the difference across the front of the building was not over a quarter of an inch, and on the axis through to the rear it is level. Not the slightest evidence of the settlement can be found within the building itself, although adjoining buildings and the street show the bad effect of this distributed load quite noticeably.

The building is trimmed entirely in mahogany, which was taken from Mexico to New York, there worked and made up in the shops, and shipped to Mexico. The entrance hall and stairs are of Italian marble, the hall floors of marble Mosaic, and the offices, where not parquet, are floored with maple. All lumber except sleepers was brought from the United States.

The elevator equipment consists of two Otis elevators. A mail chute has been installed. The three-coat plaster work over wire lath and the conduit system for electric wiring were the first work of their kind in Mexico.

The Mexican labor being very slow and inefficient where time counts, the figures of the timekeeper are interesting. The books show that on the building alone, not counting shop work, about 148,000 working days were spent, and all this in erection alone. For all finish work except plastering, stone work and tiling, foreigners were necessary. Italians formed the large part of the marble workers. Electric work was done under the close watch of Germans and Americans.

All carpenters were brought from the States for trimming, and among the sub-contractors but one Mexican was numbered.

A comparison of cost with a building of so monumental a character of recent construction shows closely the relationship of American and Mexican work.

COSTS IN CENTS PER CUBIC FOOT OF BUILDING.

	Mutual Life Building.		General P.-O., Chicago.
	Mex. cur.	U. S. C.	
Whole building	88	43.78	42.12
Foundations	9.1	4.54	1.75
Masonry	24.1	12	13.50
Plaster	4.1	2	1.88
Carpenter work		5.3	
Steel and ornamental iron.................		9.7	5.38

And in the Mutual Life building no heating system or gas was installed, nor any machinery except motors. The difference in costs of foundations is caused by the excessive cost of imported cement in Mexico, and the elaborate foundations required. No duties are figured in the above table.

The work was completed and the finished building with furnishings, ready for occupancy by the owners, was turned over in less than the contract time. The timely assembling of all the various parts of the building, the marble from Italy, the glass from Belgium, the tiles from France, all of which were ordered direct, formed an important feature in the administration, one which without the strictest attention would have resulted in failure to carry out the work promptly.

The construction was carried on under a general contract by Messrs. A. R. Whitney, Jr. & Co., engineers, contractors and builders, with head office at 135 Broadway, New York. The architects were Messrs. DeLemos & Cordes, 130 Fulton St., New York. The supervision of the construction was under the personal direction of Mr. T. Eckford Rhoades.

The Treatment of Boiler Waters.

The problem of feed-water treatment for steam boiler purposes is discussed in an interesting manner in an article by Mr. William M. Booth, a Syracuse chemical engineer, making a specialty of the subject, which appeared in the March and April issues of the "Chemical Engineer." The various processes for removing scale-forming salts are referred to, beginning with the well-known Clark process, or "lime process," which was first used in 1840-50. This process is stated to be the simplest and cheapest process for the softening of water. Physical and mechanical methods of purifying boiler waters, including the introduction of foreign substances into the boiler to form nuclei around which the particles of precipitated lime may agglutinate when the water is heated and thus not deposit upon the boiler heating surfaces, and also the use of zinc in the boiler, forming a single fluid batery, for an electrolytic action which keeps the scale soft, are unfavorably considered by the author. He reports an interesting experience with "boiler compounds" as follows:

View of Foundations of Mutual Life Building, Mexico, Nov. 17, 1903.

"During the fall of 1902 my attention was first called to boiler compounds. A concern with which I was connected had a great deal of difficulty with scale in a battery of water tube boilers as the total solids in the water they were using amounted to 35 grains per gallon, and the scale-forming solids to more than half this amount, consisting of a large quantity of sulphate of calcium. I examined the tubes and found a very compact scale about 1/16 in. thick, which it was impossible to remove by mechanical means. Kerosene was tried and found ineffective. A boiler compound company offered to remove this scale, but when granted every privilege was unable to do so; indeed, many tubes were burned out while their compound was being used. This liquid was brought to me for analysis. It was black in color, dense, had an odor of caustic soda and was very alkaline, and analysis showed it to contain mainly caustic soda in excess, logwood, tannin, sugar, sulphate of soda, and a small quantity of gum. It it needless to say that its use was prohibited. Another compound examined contained catechu, caustic soda and tan liquor. These compounds were sold for about fifty cents per gallon and cost less than six cents to make. They were, of course, 75 per cent. or higher in water. The examination of a number of samples since shows that three basic chemicals are known, even by unscientific men, to attack scale within the boiler itself. These are caustic soda, soda ash and tannic acid compounds, from sumach, catechu and the exhausted bark liquor from tanneries. A great difference of opinion seems to exist in regard to the correct material to use within the boiler for the purpose under discussion. One engineer of twenty years' experience tells me he has used potato water with good results. Another, a little molasses occasionally, while others are partial to kerosene."

There are two materials, soda ash and caustic soda, the use of which in boilers is not prohibited through action upon the metal itself or on account of price. Sodium triphosphate and sodium fluoride have both been used with success, but in cost are several hundred per cent. higher than that of soda ash. If prescribed as per analysis, in slight excess, there should be no injurious results from the use of caustic soda and soda ash. It is worth considering whether it may be practicable to manufacture an intimate mixture of caustic soda and carbonate of soda, containing enough of each to soften the average water of a given vicinity.

Caustic soda in large excess is injurious to boiler fittings, gaskets, valves, etc. That it is injurious in reasonable excess to the boiler tubes themselves has yet to be proved. Foaming and priming may be caused through excess of caustic soda or soda ash, as is well known by every practical engineer. Mr. Booth strenuously condemns tannic acid and is suspicious of the use of its salts. It may unite with an organic matter present in the form of albuminoids and with the calcium and magnesium carbonates present. That it removes scale is an assured fact, that it removes iron with the scale is also assured, as tannic acid corrodes an iron surface rapidly. Compounds of vegetable origin are widely advertised, but often contain dextrine and gum, both of which are dangerous as they coat the tubes with a compact scale not permitting the water to reach the iron. Molasses is acid and has no place in the boiler, and starch substances generally should be denied. Mr. Booth has not investigated the action of kerosene, but knows that in large quantity its use must be very dangerous, as it is a very volatile oil and must soon leave the boiler and pass over and through the engine.

Boiler compounds should contain only such ingredients as will neutralize the scale-forming salts present. They should be used by prescription only, so many gallons per 1,000 gallons of feed water. A properly proportioned mixture of soda ought to answer the demands of all plants depending upon this method of softening water in limestone and shale regions. It is to be remembered that a number of chemical salts, some of which suffer decomposition at the temperature and pressure of the boiler, are always found within the boiler itself, if the feed water is softened by boiler compounds. What occurs chemically, under such conditions, is a question, and salts of magnesium probably suffer considerable decomposition.

For small isolated plants requiring the softening of water, boiler compounds can hardly be replaced on account of the simplicity of their action and use. Their cost should not be prohibitive, and they should render efficient service in connection with the particular style of the boiler. Steam saw mills, cheese factories and small power plants, generally, often cared for by incompetent and careless engineers, require some material easily applied. The honest boiler compound is ready to solve the problem. For plants of from 75 to 150 h.-p., 24-hour settling tanks will answer the purpose of a softening system. Two tanks, each capable of holding a day's supply and furnished above with lime and soda tanks in common, and provided with sludge valves below, may be used for this purpose. Paddles in each tank capable of thoroughly stirring the contents may be actuated from above. Very large plants are operated on this principle, serving boilers of many thousand horse-power. Such a system has an advantage over a continuous system, in that the exact amount of chemical solutions, required for softening the particular water in the tank, can be applied. For some variations of such a system, several companies have secured patents and are doing a large business. The fundamental principles themselves are not patentable, and have been used for many years.

For a plant with a boiler capacity of 500 h.-p., a water softening system is capable of saving a great deal of money. The present tendency in connection with manufacturing concerns is to group in one battery boilers aggregating thousands of horse-power. They are more easily cared for, more easily handled and render more efficient service than many isolated units. For such plants, boiler compounds and settling tanks are replaced to advantage by water-softening systems, capable of treating several thousands gallons of feed water per hour. The lime-soda ash treatment has been found to be very efficient for ordinary waters. The soda ash is usually added in slight excess. It is very necessary to the engineer of such a plant to have at his right hand the services of an experienced chemist, to whom, periodically, the water should be submitted both before and after purification.

This method of treatment is possible in plants in most sections of the Middle States, where waters used for boiler purposes are usually hard, containing lime and magnesia, the shale sections also adding a large amount of sulphate of calcium to the water. Waters on the Eastern coast are ordinarily very soft, and in New England much of the superficial rock is of a granitic character which produces scarcely any scale. The water of the West contains a large excess of alkali, more particularly the Southwest, and the problem of making this applicable to boiler use is yet but partly solved. The very substances that are found in the Eastern waters at the conclusion of the softening process, that is, sulphates of soda and magnesium, are found in very large quantities in natural waters in the West and on the lines of the Southwestern railways, sometimes 30 to 40 grains per gallon, and above; lime is sometimes added to these waters to produce a slight scale and to prevent foaming. In the Northwest and middle West, much of the water is highly charged with organic matter, which requires a coagulant, and several firms have been successful in removing this form of incrustation with alum compounds, principally aluminum sulphate.

Continuous Measurement of Crushed Materials.

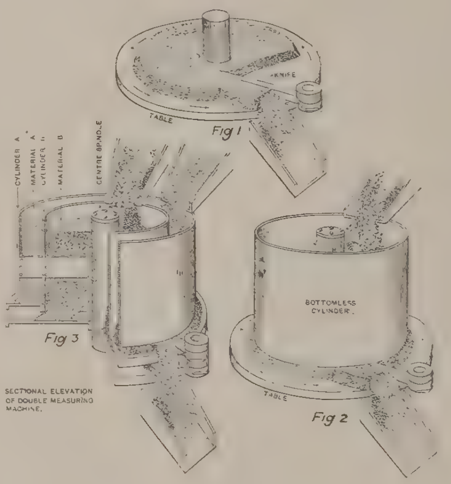
The accurate proportioning of crushed or powdered materials is an important part of many industrial processes, and a number of methods have been proposed for doing the work continuously rather than in batches. Among the devices for this purpose are screw conveyors, shaking spouts, revolving pockets, revolving rolls, reciprocating tables and revolving tables. In a paper on the last type presented at the recent convention of the American Society of Mechanical Engineers Mr. E. N. Trump, general manager and chief engineer of the Solvay Process Co., points out that if we make the table of relatively large size and distribute the material in a uniform layer over it, as shown in Fig. 1, the stationary knife, or diverting blade, may be pivoted so as to take off a predetermined quantity in one revolution, and if the layer is thin, variations in the natural slope on the edge will affect the accuracy very little. As the table revolves the stationary knife will divert the material in front of it over the edge of the table, and it will fall in a continuous stream into the chute. If the material is replenished on the table so that the layer taken off by the knife is restored to exactly the same shape as before, and is continuously removed by the knife, an accurately measured quantity will be diverted.

By adding to the table a bottomless storage cylinder, somewhat smaller in diameter, with its lower edge spaced a distance above the table sufficient to clear the knife and yet near enough to the table so that the material flows out from under the edge of the cylinder and takes its natural slope, we shall have the condition represented by Fig. 2.

The cylinder being supported by arms from the central spindle, it may be filled to the top by means of the chute, and as the knife removes the section represented by its path over the table the material from the cylinder above will take the place left vacant and will come out under the edge of the cylinder to the extent of its natural slope. While this slope may vary a little, this variation is a very small part of the amount diverted by the knife, and as the material composing nearly the whole base of the cylinder is cut away the space behind the knife is filled from above with nearly uniform pressure, and in practice the natural slope angle is almost exactly the same, in spite of considerable differences in height of material within the cylinder.

After deciding on the distance between the bottom of the cylinder and the table, and the width of the knife, the other factors which determine the amount of material measured off in a given time are the speed rotation and the depth of the cut of the knife, and these are both adjustable. The depth of cut of the knife is adjusted by swinging the knife around on its pivot so that it extends a greater or less distance into the material. This swing is controlled by a screw attached to an arm, cast as part of the knife, and a micrometer scale with pointer shows the amount of movement.

The mechanism described above may be employed for the feeding of a great variety of materials, varying considerably in size and consistency, and if the size of the table, the shape of the cylinder and the size of the knife and space between the cylinder and the table are properly adjusted, almost any kind of crushed material may be fed. The variations in size may extend from fine powders, like cement, to rocks of 6 in. cube. In the case of the larger sizes the space between the bottom of the cylinder and the table is made considerably higher than the height of the knife, as the space between the bottom of the cylinder and the top of the knife must be sufficient to let the largest pieces pass through without catching. The amount diverted by the knife is not dependent upon its height, but on the height of the space under the cylinder.



Diagrams of Measuring Tables.

As an example, in the case of a table 12 ft. in diameter feeding rocks of 6 in. cube, the variations for a single revolution where some 6,000 lb. were diverted showed less than 2.5 per cent., and for 10 revolutions the variations were less than ½ per cent. of the quantities. With finely powdered materials the variations in the quantities by volume are considerably less than this.

A measuring table of 3 ft. 6 in. diameter is being used as a meter measuring the quantity of powdered material delivered to a series of furnaces. The quantity was formerly ascertained by passing the material through a hopper scale, where batches were continuously weighed by an attendant. The measuring table was calibrated in different positions of the knife and the total quantity measured by it was checked for two consecutive months. The variations from day to day, where 12 to 15 tons of material were measured, were less than 50 lb., and the total differences for a month, for a measurement of 400 tons, showed in one case 108 lb. and in the other case 150 lb. As these variations were both sides of the average, the results of the scales were as doubtful as those of the measuring machine.

The same machine filled to the top of the cylinder was revolved and the material for each revolution weighed separately, the depth of the cylinder being about 3 ft. The quantities for each revolution were within 0.1 lb. of each other, on a weight of 5 lb., and no variation occurred until the material reached within 6 in. of the bottom of the cylinder, when it began to decrease a little in quantity for each revolution.

As the function of a perfect mixer is to deliver the materials in proper proportions in the closest possible contact, they should be brought together in superposed sheets while falling from the table so that the least amount of mixing is required later. To accomplish this end with but one revolving part the arrangement shown in Fig. 3 is adopted. Two or more tables are set one over the other, and the cylinders supported from the same spindle, so they will revolve together. Each table has an adjustable knife, by which the proportions of the mixture are controlled. As the material is diverted over the edge of the upper table it falls into the material coming from the knife next below, and these two quantities fall into the material from the third table, and so on.

The spouts which feed the storage cylinders may be so arranged that the revolution of the cylinder automatically keeps the cylinder full, the material itself preventing more issuing from the spout than is necessary to maintain a constant level in the cylinder.

Hoppers may also be employed, into which the material can be dumped from wheelbarrows, fed with shovels, or drawn intermittently from a spout at comparatively irregular intervals, the only attention required being to keep the cylinders reasonably full. The volume may be allowed to vary 50 per cent. without interfering with the accuracy of the quantity diverted by the knife.

With very finely divided powdered material, which flows very freely, it may be necessary to place a special mechanism in the top of the storage cylinders to regulate the pressure from the contents of a large bin so that it will not force the material to flow with too great a difference of velocity, these finely powdered materials being prone to stick in the bin and when once in motion to have almost the mobility of water.

These machines may be used for the measuring and mixing of various chemicals, measuring and mixing of dry colors, mixing of glass batch, the proportioning of ingredients for the manufacture of special plasters, and for making sand-lime brick, the blending of coffees, the measuring and mixing of flour, sugar, etc., in bakeries and confectionery establishments, for the combining of ingredients in fertilizers, and for a variety of chemical and industrial processes in which accuracy of measuring and mixing and reduction of labor, and especially of skilled labor, is desirable. As a feeding mechanism in continuous furnace processes for mills, or crushers, requiring regular feeds, and especially for the rotary kilns used in cement making, these machines have been found to be especially well adapted, and to increase materially the efficiency of the mechanism on account of the greater regularity of the operation. One adaptation which gives promise of great use in the industrial arts is the proportioning of the cement, sand and stone, with the addition of the necessary water, in the manufacture of concrete.

The Coal Production in the United States last year amounted to 351,196,953 net tons, valued at the mines at $445,643,528, according to the statistics of Dr. Edward W. Parker. This shows a falling off of 6,159,463 tons in comparison with the output of 1903, but this decrease does not indicate any real interruption in the use of coal, being due to the exhaustion of coal stocks by the strike of 1902. The amount of anthracite mined in 1904 was 65,318,490 tons; about 2,500,000 tons of small size anthracite were also recovered from the culm banks. In this connection it is of interest to observe that the amount of fine coal of pea size or smaller that has been shipped has increased from 23 per cent. in 1890 to 38 per cent. in 1904.

Can a Steam Turbine be Started in an Emergency Quicker Than a Reciprocating Engine of the Same Power?

A paper read before the American Society of Mechanical Engineers by A. S. Mann, Schenectady.

If a large steam turbine is cold and at rest, how quickly can it be started? Can it be brought up to speed as readily as can a good cross-compound engine that is cold all over? Most station men would have doubts as to the adaptability of the large turbine, say 1,500 kw. or 2,250 h. p., for emergency work. So much has been written about the sensitiveness of a rotating disc to the changes of temperature and the effects of unequal expansion that it is easy to imagine difficulties in the rapid start. The possibilities of an engine with a 62-in. low-pressure cylinder in starting practically cold and coming up to synchronous speed are well understood. A station manager would criticize an engineer who would open his throttle as fast as he dared without wrecking his piping system and let his machine jump into her work. One turn at a time on the throttle is about all that is considered safe, and even then a close watch is kept for groaning valves and cold back bonnets.

Every time the starting valve is moved to increase the steam flow the engine is allowed to take its full increment of speed, due to that particular throttle position before the supply valve is moved a second time. There are ten large oil cups, and frequently more, that must be opened and adjusted before the machine moves at all, besides whatever oiling is to be done about the air pumps and other auxiliary apparatus.

Most engineers would consider ten minutes as rather a fast start and fifteen minutes as a more usual starting period, including time taken for warming up; in fact, it may not be overstating the case to say that if it were known that an engine-driven plant were to be called upon in emergency for power and it were essential that the briefest possible time were to elapse between the call and the taking of the load, one or more engines would be kept in motion all the time, turning slowly and hot all over.

This question makes itself very prominent when the steam station is operated as an auxiliary to a large source of high tension power, which is itself in the construction stage and has a large overload capacity of its own to carry, supplying all sorts of apparatus that use electric power, railway, lighting and power circuits, simultaneously. At such a time all sorts of accidents will happen to the high-tension water-driven plant, most of them due to the necessarily temporary character of many of the electrical connections. It takes months before an intricate system of wiring can be thoroughly relied upon, for it takes months before the temporary work of construction can be replaced.

The station at present under consideration is equipped with three Curtis turbine-driven alternators, 40 cycle, 10,000 volts, each of 1,500 kw. normal capacity. During the summer months the station is operated as an auxiliary to a water-power plant, taking all sudden overloads. A signal has been arranged, a ¾-in. whistle, so that it can be blown instantly should the power fail. A blast of that whistle means cut in two turbines and bring the third up to speed. The load will be heavy, and all auxiliary apparatus must be in regular operation.

Each turbine has a surface condenser and there are three or four pumps to be started for each pair of turbines; one circulating pump, one combined hot-well and feed pump, one pressure pump for the step bearings and one dry-air pump, all of which are motor driven. The exciter is driven by a steam engine and must be started also, for it supplies current to a portion of the auxiliary apparatus.

The boiler room has steam up at all times, supplying a system for manufacturing purposes other than power, and slow fires are kept in enough boilers to make steam needed for the normal load. Forced load means forced fires. The boilers have under-feed stokers, equipped with pressure blast, and will respond quickly to a 50 per cent. excess call for steam. The operating force for this is about equivalent to a force for an engine-driven plant. Engineers and oilers, however, are busy about the building on construction work, installing new apparatus and taking such work as their regular occupation when the turbines are not running.

At the sound of the whistle the water-tender starts a blower on the extra row of boilers; all blast dampers are opened up and all stokers are allowed to feed at the maximum rate. Each fireman dumps his free ash and bars over his red fire. The man in charge of the coal and ash conveyor starts the pressure pump for step bearings. One of the turbine men starts the exciter which supplies current to the auxiliaries beside its field current; a second turbine man starts the circulating pump and then his turbine. The hot-well pump and the air pump are started by the oiler. These movements take place simultaneously. The force is organized upon the lines that obtain in a fire station; each man has his specific duty, and after performing it looks to see that there is nothing more for him to do. Only a few seconds elapse between starting the first pump and starting the first turbine.

The turbine throttle is opened as fast as an 8-in. steam valve can be opened without endangering the steam piping system. It is not considered advisable to open the throttle valve as fast as a man's strength will permit, but if nothing unusual occurs in the pipe line sentiment does not spare the turbine.

One electrician attends to the switchboard and telephone. As soon as the machine approaches speed the synchronizing system is cut in and the main switches are got ready. One and one-half minutes will do all the work here outlined, including the considerable time taken in mustering the crew from various parts of the building.

Manipulating an engine regulator so that it shall be at a precise speed and at an exact phase relationship from some other machine, not more than 1-1500 part of a second removed from it, is no matter that can be hurried, and one minute is fast time on such work. But the whole thing, phasing-in and all, has been done in 2½ minutes, including full load on the turbine, which started from a standstill.

This performance has been gone through a great many times, and our record book shows that out of 43 such calls 10 starts were made in 2½ minutes, 18 in 3 minutes and 15 in 3½ minutes. We have taken the time in a number of instances when all the auxiliaries have been in motion and it only remained to start the turbine and phase it in on the line; the only valves to open in such cases are the throttle and one small oil valve. The two quickest starts have been made in 45 seconds and 70 seconds, respectively, including phasing-in. Others range between 1 minute 10 seconds and 1½ minutes. These two quickest starts were made on a turbine which had stood for 24 hours with the throttle valve shut tight, though there was a slight leakage past the seat. After the throttle valve is off its seat it is not more than 30 seconds before the turbine is up to speed. A cross compound reciprocating engine of the four-valve type, 2,250 h. p. capacity, can be brought up to speed from a standstill in five minutes if it is hot all over. This five minutes is to be compared with the seventy seconds required for the similar turbine operation.

A reciprocating engine, which is turning over slowly with the throttle valve just off its seat or with by-pass open and having all its oil cups open and regulated, can be brought up to speed, say 75 turns, in 2½ minutes. This can be compared with the 30 seconds necessary for bringing the turbine up under the same conditions; that is, about one-fifth the time necessary for bringing up the engine.

If the engine is cold all over and has all its oil cups shut tight, all its auxiliaries quiet, 15 minutes is called a rapid start. Starts have been made under such conditions in 12 minutes. When we start a cold turbine we open up the valve and let her turn, and in two minutes we are ready to bring her up to speed and she will be at speed in 2½ minutes, dividing the engine's time by more than four.

Performance of Simple Mechanical Filters.

In the issue of this journal for April 22 a brief mention was made of the simple mechanical filters of the Rochester & Lake Ontario Water Co. The water passes through 3 ft. of sand into perforated brass pipes connected with a center manifold having a branch bolted to the bottom of the filter shell. The perforated pipes rest on a level bed of concrete. The sand is of a size designated in the trade as between 14 and 20, and is very uniform. The washing is done by simple reversal of the current. There is no sedimentation basin, and the coagulant, sulphate of alumina, is fed into the 24-in. suction pipe of the pumping station several hundred feet from the suction well.

Some analyses showing the operation of these filters have recently been received from Mr. J. W. Ledoux, chief engineer of the American Pipe Mfg. Co., builders of the plant. Samples taken from Lake Ontario about 23 ft. below the surface on April 12 and 13 showed 300 and 216 bacteria per cubic centimeter, while the filtered water contained 11 and 8, respectively, without any B. coli. Similar filters are used in Sayre, Pa., where the plant was also built under the supervision of the American Pipe Mfg. Co., and recent analyses of the raw water and effluent gave the following numbers of bacteria in the river water and filter effluent:

Date.	River.	Effluent.
March 29	71,958	320
March 30	4,300	142
March 31	2,875	13
April 1	3,791	21
April 4	2,833	14
April 13	1,475	17
April 14	500	10

The raw water was taken from the intake crib, while the filtered samples were drawn from a spigot in the filter room. None of the filtered samples showed any indication of fermentative bacteria when examined in small quantities, but in 50 c.c. quantities some fermentation was occasionally indicated. The raw water always contains B. coli.

An unusual cantilever bridge which carries a highway across the Mattig River, near Braunau, Austria, has a total length of about 213 ft. from end to end of the continuous superstructure and consists of a center span of about 103 ft. and two 53-ft. end spans. The center span has two riveted trusses with horizontal bottom chords and curved top chords. Vertical members divide it into panels, each of which is braced with a single diagonal member. One panel at each end of the truss has a solid plate web, which is continuous with the cantilever projection that extends about 10 ft. beyond the center of the pier. This cantilever supports the river end of a girder which is carried at the opposite end on the abutment. This combination of truss and plate girder, together with the combination of free and cantilever spans of such short lengths, presents a curious appearance.

The Organization of Working Forces in Large Power-Houses.

Paper read before the National Electric Light Association by W. P. Hancock, of the Boston Edison Electric Illuminating Company.

As this paper will deal with the matter of organization of working forces in large power houses, we will assume that we have approved and economical apparatus, on both the steam and electrical ends of the system; that being true, it would seem that if we added an organization to operate such a system so that the best results would be obtained from the complete plant, we should find our generating cost per kilowatt-hour satisfactory.

As there are companies whose generating accounts are not identical with ours in Boston, with reference to the charges placed under the head of "Generating," I will mention here that I shall deal with a department that contemplates the expense of operation, also the repairs and renewals of all steam and electrical machinery and apparatus, including storage batteries, necessary to generate and deliver to the 'busses and switchboards the output of the generating system, the necessary distribution from substations, and including, of course, all labor, from the head of department to the errand boy on the office end, from the chief engineer to the coal passers on the steam end, from the chief operator to the cleaners on the electrical end, also the battery engineer, his assistants and workmen; and when the total charges are made at the end of the month, and are divided by the kilowatts generated, we shall have the legitimate generating cost per kilowatt, so far as an organization for that purpose is concerned. There may be other charges made against the department, but they are not made by reason of being directly connected with that portion of the total system. It may be well to say at this time that the Boston Edison generating department organization is made up as shown on the diagram.

Having seen what the organization seems like on paper, we will follow down the line, beginning with the steam division.

Steam Division.—The chief engineer of the steam system is, of course, totally responsible to the head of department, or his representative, for the good and economical operation of that system; and in order to be able to assume that responsibility in a manner favorable to the company's interest, and with success for himself, he must have among his various accomplishments a few which I will mention, and which I claim are extremely important.

We will assume that he came to us with the necessary license, that he has had a good and varied experience with steam engines and auxiliaries and is a first-class mechanic. Perhaps we know him by reason of his having been employed on a nearby system for some time, and, if this be the case, we have had the opportunity to see what kind of an organizer he is, what his judgment is in the hiring of men, whether he has the ability to maintain discipline among his men and takes an interest in knowing whether or not it is maintained, and whether he plans the work of his system and passes his orders to his first assistant, to be passed by him down the line, in such a way as to avoid the bad complications caused by conflicting orders given by himself and his first assistant to a watch engineer, perhaps to others of his organization. We can see whether he has favorites among his men by reason of earlier acquaintance with them; if he has and it is apparent, ,we know there is trouble ahead. We can see what his inclination is when the load is going at the beginning of the summer and the pay-roll will stand a reduction, not in the rate of wages but in number of men employed. We can see whether or not he has the "hustle and push" to put the system on its feet and keep it there, without having to be reminded that it is for that purpose that he is drawing his salary; also if he takes a keen interest in matters to such a degree that if he doesn't hear from certain items in his system he will go after such items and not take it for granted that they are all right or he would have heard from them.

If arguments arise between any of the men and their superiors, does he act absolutely on his best judgment, or does he allow it to be warped because the man who is in trouble with his watch engineer is an old man—not in years, but on the system—and he thinks that man can not do wrong? If he does favor the man at such a time and the man has done something irregular he will make the mistake of all his time on that system, with reference to discipline and organization. He will regret that decision for a long time to come, for then and there the man in the ranks practically becomes licensed to disobey his superior next above him, and that fact is very soon known among the men in his and other lines of work on the steam system; the watch engineer is thereafter ignored to a degree by the men over whom he is in charge, and he is not to blame if he leaves his position, rather than lose his reputation that he may have earned by his ability to work his watch successfully and to the interest of his employer.

It is the business, and a valuable part of the business, of the chief engineer to administer in such cases in a manner that is just to all concerned, from the interests of his employer down to the interest of the man who was disobedient, and also in such a manner as will preserve the dignity of his position and, at the same time, by reason of just decisions, retain the respect of his total organization. He should administer justice without fear or favor, and while the way may be rough for a while it will assuredly smooth itself in due season; and what could be more satisfactory to the head of the steam division than the positive assurance that his assistants and men were working in harmony for their own interest, for his interest and for the interest of their employers?

I claim that if the head of a steam division has not the ability to take care of these matters on these lines, the organization will be far from satisfactory from the standpoint of good service and economy. Almost any chief engineer can continue to hire and discharge men at short intervals and claim that as his only alternative; but if he does, it is a loss to his employers.

First Assistant Engineer.—The engine-room is in the immediate charge of the first assistant engineer, who directs all of the work from orders given him by the chief engineer. As he, of course, can not be on watch more than the regular hours, unless in case of emergency, the orders are transmitted by him to the watch engineers, and in absence of the chief engineer these men have, in their consecutive order, absolute control over every piece of steam apparatus and the appurtenances thereto, from the ends of the crank shafts to the outer end of the circulating water intake, including all labor incident to steam operation.

The first assistant and his watch engineers are busy men. I say "busy," because, if they are not, they are in the wrong place, for on these men we place secondarily the responsibility of the steam apparatus and its operation. The first assistant is especially held responsible for economy of operation, both in labor and material, of the steam system. He must notice and report to his chief any repairs needed, whether large or small, whether it be the keying of cranks or wrists, opening of cylinders, adjustment of pistons, packing leaky valves or glands, leaky steam lines, whether they be main or drips; must look after the water lines; the proper working of the air and circulating pumps; the condensers and canals; the undue consumption of cylinder or engine oil and waste; the oil system, and also, incidentally (although he has a watch engineer in charge under him), must notice and criticise the number of boilers in line to operate the number of engines in service when using certain grades of fuel; in fact, it is required that he be a man who can think quickly and not take too much time to execute. He must be thoroughly conversant with every line of steam and water pipe, every valve and its use, and what will probably occur if misused. It is his duty to instruct all of the men under his charge in the working of every piece of apparatus in the steam system, and if he is found to have inclination to dispense only such information as is absolutely necessary for his men to operate with, with an idea that he knows the system as no other man does, and he thereby hopes to insure his position more permanently, he is not the man for the place, because he is working for his own interest specially and incidentally only for that of the company. On the other hand, he should make especial efforts to have every man under him thoroughly conversant with the system; first, because it is for the best interests of his employers; second, because in a way it will lighten his own labors; third, he will receive the credit due from his men, and those men will appreciate his efforts to place them aright in their work; and, last of all, his chief will appreciate the fact that he knows how to work his men and produce results that the company is looking for, and this without discontent in the ranks.

Again, there are cases of emergency when the first assistant is required to work overtime, and so must his watch engineers as well, and their men, and here the treatment of the men should be thought of. If they are working by the hour and are allowed overtime they will probably be satisfied; if they are working by the week and don't get overtime but do get a number of days off with salary each year, they may feel that they are losing something by reason of such emergency. In such an emergency my instructions are to see that the men are well fed and that they are given such reasonable time to recuperate as the load demands on the system will admit, and I may say that with this latter method we have no difficulty.

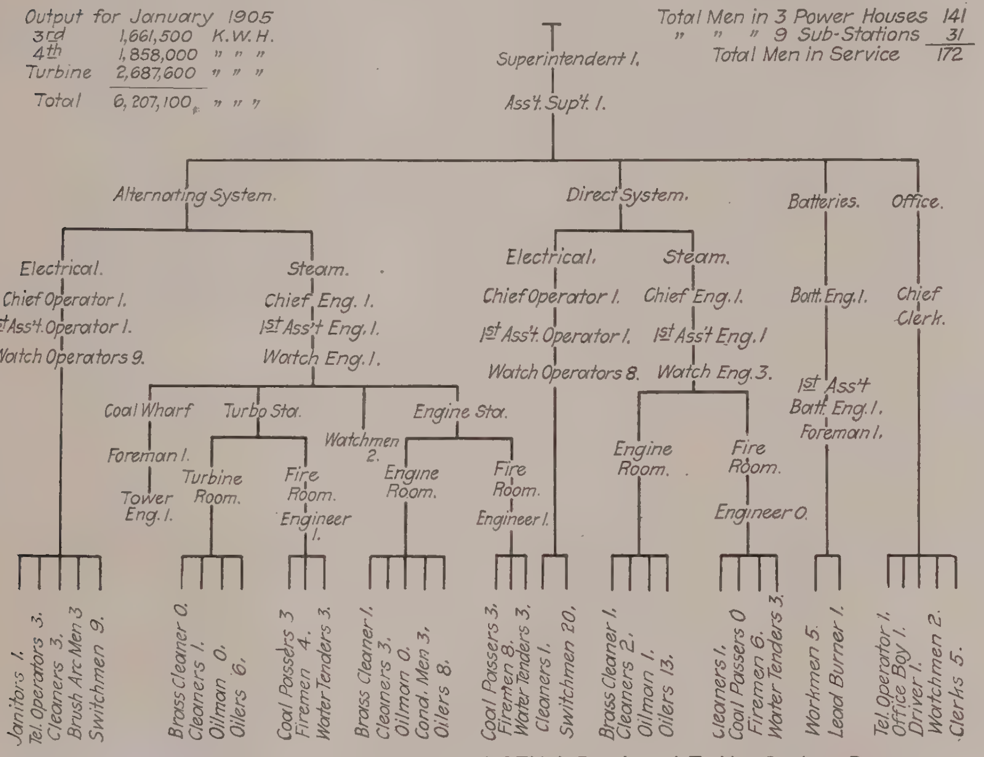
Watch Engineers.—Of the watch engineers we must require as nearly as possible the duties of the first assistant, with the addition that the orders of the latter, as to work to be done during the hours he is absent, are to be strictly obeyed, and the results must show favorably when he again appears on watch. It is in these cases particularly that good discipline among heads of divisions shows itself prominently, and if it does not exist, the repairs on apparatus will fall behind, and, little by little, we shall begin to find the system in a bad position and one from which it means hard work and long hours to get back into line.

The Oilers.—The oilers come next in line in the engine-room, and on these men we rely to keep the engines in operation after once started and to know absolutely that the large number of oil feeders and grease cups found to-day on reciprocating engines are in proper operation. An oiler must give immediate notice to the watch engineer of any irregularity in the operation of his machine; must see that he is using enough oil, and not more than enough, and when his machine goes off the line must wipe it up and clean it ready for the next run. These men are important in their positions, whether the title implies it or not, for power stations, unlike steamboats, cannot afford to shut down to cool hot bearings, nor can we afford to let the customers drift, as the commander might let the ship drift at sea if emergency occurred and weather and sea room were favorable.

I consider an oiler important when the question of hiring men comes up in the fall. I lose no opportunity to take the name and address of all men who have had experience in that line, and find such a list very useful when the fall load begins to appear.

We should, and on our system we do, pay oilers who can oil an engine properly one rate of wages, and that only to such men as are competent to run the pumps when required; and with beginners on the system we practice the method of moving them along and higher in the matter of wages as they grow more proficient in the work, and lose no proper opportunity to show them that proficiency is the one thing most needed, and that such an acquirement, together with a strict observance of orders from their watch engineers, will lead them to acquire the maximum wages paid for that line of labor.

The cleaners come last in the line of engine-room labor, for in the matter of repairs the first assistant and such oilers as are at his command take care of such repairs as can be properly done in the station, while such repairs as are heavy, or those that require machine work, are done by contract by outside parties, our experience being that this is the least expensive method.



Organization of the Operating Staff at the Third, Fourth, and Turbine Stations, Boston Edison Illuminating Co.

The cleaners should be in evidence in every well-regulated power-house, for the reason that in these days of modern buildings and machinery nothing detracts from the appearance of an engine-room more than filth. In my opinion, when we consider the vast number of customers we serve and the prospective customers who visit our power-houses by virtue of passes given them from our general offices, we can afford to keep our stations clean and add to our reputation in worth more than the cost amounts to, and I think any conservative central-station man will agree with me. More than this, the cleaner is a general utility man; he is useful at a great many times when another man or two must be had, and in case of emergency we can, under the eye of the watch engineer, have him oil an engine or do other work properly in his line.

The Boiler Room.—We can now take up the operation of the boiler-room, that portion of the system which can be so handled as to assist greatly in paying dividends, and can also be handled in such a manner as to be largely the means of passing one, especially if the coal supply is uncertain as to quantity and quality, for in this latter case we must necessarily save at every other point in order partially to make good such deficiency Therefore let us at once have the fire-room in charge of a competent man whose immediate superior is the engineer on watch. We need a man for this place who carries a first-class engineer's license; one who has had experience in the engine-room and thus understands practically how the load rises and falls; one who will keep in touch with the watch engineer and realize that it is absolutely necessary that he does keep in touch with that man and knows as far ahead of time as is possible what his future needs will be.

We need in this man ability to supervise repairs of all kinds in the boiler-room, including boilers, pumps, headers, leads, valves, furnace brickwork, grates, and all other items in that part of the system. We want him also to be a man of sterling worth in the handling and judging of men. We want him to realize that a fireman is a man, and, as such, is entitled to proper treatment at all times. We want him to have ability to judge whether or not a little encouragement will bring out the best efforts of the man, or whether it is necessary in order to obtain such efforts to place the man strictly on the line and make him understand what results he must obtain if he stays on the pay-roll. We want him to be obedient to his superior and be able when he goes off watch to have his work laid out to cover the time until he again appears; such a man as I describe should receive the same salary as a watch engineer, not because he ranks as high in the line, but because he can earn the money.

The Water Tenders.—Next come the water tenders, who are in charge of the fire-room watches when the foreman is off watch and who, in such periods, are immediately responsible to the watch engineers, and have a quota of firemen under their charge, as well as all other men of the fire-room force. The water tender may be apparently perfectly competent to occupy his position by reason of his coming to you with a proper license and a long list of recommendations from former employers, but the question will arise as to whether he will fill his proposed position as follows: Will he pay strict attention to the instructions given him by the foreman of the fire-room, or the watch engineer, if that man be in charge, as to the probable demand for steam; does he watch his boiler feed and regulate his boiler feed-water apparatus so that with a heavy demand he is not caught with water too low, and then when absolutely obliged put in water in larger quantities than usual, causing his firemen to do some very heavy work and probably some uneconomical firing, a few repetitions of which will cause complaint and discontent among his men? And, from the other point, does he pay attention to the decreasing load and work the water up to the proper point, and go along the line and watch the depth of the fires, and instruct his men, as per his instructions from the watch engineer, that the load is "going," and to avail themselves of the opportunity to clean fires, to fire light, or bank, or both? Does he watch the steam leaks within the limits of his portion of the boiler-room, and does he see the small repairs needed and report them to the engineer of the watch, even though he feels sure that the engineer knows of those matters? And, finally, has he the interests of the company in view? If he does not properly deal with these items he is not the kind of water tender we want, no matter what his ability actually is. It is extremely important that the watch engineer take particular notice of the water tender, not only as to his ability to perform his proper duties, but also as to his inclinations, and report to his superior if the man is delinquent in any way.

The Firemen.—The firemen are those of the force whom we must select with care, for the type we need must have had experience, and must have judgment and be reliable. That is to say, we can not afford to have a man with us who is afflicted with pay-day sickness. We want him eight hours a day seven days a week, and I am glad to say we have a large number of this kind who like their positions well enough to work steadily for the periods mentioned above. We want men who will obey the instructions given them by their superiors, and those who are free from connection with any organization that would interfere with men that are getting satisfactory wages and treatment and are contented. We want men who, when occasion requires, will hand-fire 2000 pounds of coal an hour, and do so for several hours, if necessary. We want men who will burn coal, and not simply dispose of it; men who will use judgment in both firing and cleaning fires, and if the plant is using stokers of the type we use on our system, it is of the greatest importance that he should watch the coal as it comes to him and regulate the depth of the feed and speed of the grate in accordance with both the quality of the fuel and the demand for steam as his best judgment dictates, and act promptly on instructions given.

Firemen are a class of men who must of necessity do very hard work, and they are also a class of men upon whom the power stations are to a large degree dependent for their continuous operation. Both of these facts should be taken into careful consideration, especially as to the treatment of these men, and as to the wages paid them—two items which should be uniform throughout the fire-room; I mean by this, that all first-class licensed firemen should receive the same wages; not because a man comes to you with a license, nor because he claims he is first-class, but I mean that he should go on the pay-roll at your stated rate for first-class men in his line, and it is for the water tender, or other higher authority, to determine in the first few days whether or not the man can substantiate his claim If it is found, after due trial, that he can not perform his portion of the work, then he is not entitled to the rate of wages that the others are who can. Shall we then tell him that he must work for less wages? I say no, but rather take him off the pay-roll and tell him, in a proper manner, why he is taken off, and at the same time eliminate any chance for the others to argue on different rates of wages and the comparison of abilities. In other words, I don't want a new man to come on the pay-roll and stay there unless he can handle the work as well and to the same amount as his fellows, and I want but one rate of wages for firemen, and that a fair one, and the man who proposes to earn that rate must be equal in ability to any who are classed under the rate.

As to the treatment of the men as a whole, I have learned by experience that a small amount of favoritism made apparent in the fire-room can and will cause discontent and a tendency to avoid the regular amount of work due to be performed by each man, because an idea is harbored to the effect that the other fellow is having an easier time; as, for instance, a water tender may so conduct his watch as to make the following watch clean fires when his watch should have done it, which entails on the men following a larger amount of work than they should perform, and also causes the later to use an amount of coal not in proper comparison with the load on the system during the time they are handling the fires. Such matters should result in a hasty but nevertheless thorough investigation, the facts should be gotten at, and those guilty of such practice should receive positive assurance of what would happen if a repetition should occur.

I may add that we try to operate fire-rooms as closely as is possible on this basis, and that we find no trouble in placing first-class help in this line in front of the fires. We have good men go off the pay-roll in the spring, when the load falls off, who leave us with good feeling, and by early autumn we have many of them back again looking for their old jobs, as they know by experience when the load begins to rise and more men are required.

The Coal Passers.—Last among the men classed as boiler-room help come the coal passers. On these men we depend not only for handling coal but for the cleanliness of the room, and although it is a hard place to keep clean, it can be done to a degree that is eminently satisfactory to all who enter it. A little spare time on each watch, especially on Sundays and holidays, when the load is below normal, can be used in a manner not to cause reflection as to expense and, at the same time, make even the men who work in the room feel a sense of content, while a like feeling could not obtain in a fire-room which contained the dirt and filth of months of accumulation, with no prospect of its ever becoming any better.

The Electrical Division.—We can now take up the other half of the system, so to speak, or the electrical portion. This part of the organization is divided into six parts, as the classification diagram indicates. We depend on this portion of the labor system for many important items of operation, the most important of which are: First, a uniform pressure at the feeder terminals throughout the entire system. Second, the proper and economical loading of machinery under the charge of the division; and, third, we hold this division responsible for the welfare of all electrical machinery, which must be, so far as possible, always ready for operation.

I may say that all repairs, except minor ones, in the division are done by outside parties. With the modern stations of to-day operating lighting and stationary motors and other low-tension apparatus, at the same time delivering alternating current to substations, there is involved a vast amount of apparatus, due to the fact that we must have as much flexibility as possible. We must also have several ways of attaining the same object, as to the delivery of current, in order to safeguard our customers against interruption of service and, incidentally, preserve our reputation for being a reliable concern to deal with. It follows then that we need in a chief operator a man who is absolutely reliable, preferably one who has come up from the ranks and has long since become acquainted with the practical side of operation; one who realizes and instills into the minds of his assistant and men that one of their most important duties is so to manipulate the load with reference to machines to be operated that all units will be loaded to just as near the most economical operating point as it is possible to have them under the existing conditions. He must at all times be in close touch with the chief engineer and, so far as possible, give the steam division advance notice of his probable demand for steam units, thereby giving everybody a chance to be ready, and giving the customer the opportunity to verify our claim that we are at all times ready to supply current. Above all other things, he must have and use good judgment in the selection of his men and the treatment of them, and must conduct his division in a manner that will not only produce satisfactory service, but will be conducive to contentment among his men and will secure for himself their confidence and respect, which once secured and properly held will be a large factor in maintaining what is as nearly as possible ideal operation.

He should always follow the system of hiring new men at the lower end of the line, and moving those who have acquired a degree of proficiency along to a proper position in accordance with such proficiency, thereby giving them the encouragement of understanding that the greater their proficiency the more valuable their services will become to the company, up to a certain limit in that line of work.

Assistant Operator.—The assistant to the chief operator must be a man who can assist his superior, and to that end he must be thoroughly familiar with all of the electrical apparatus in the division. He must be able to occupy the position of the chief operator when necessary; in fact, he must be a first-class understudy, and must realize the fact, too, or he will lose to some degree the sense of his responsibility. He should circulate among the substations and correct and report any irregularity noticed in machines or operators; in fact, he should keep his superior constantly in touch with such details as do not come immediately under the notice of the chief operator, and in cases of emergency should come at once to the station and be ready to assist if needed.

The assistant should also be extremely careful about the placing of his orders with the men, and in matters outside of absolute routine place no orders without the consent of his superior; many mistakes are avoided if every one concerned is conversant with what is to be done, and with our means of communication in these days, not much time need be lost in giving notice.

Watch Operator.—The heads of watches should be, and necessarily are, men who have come up the line and who understand all the electrical combinations that can be made with machines, switches and lines throughout the system; if they are not, they should not occupy that position, nor should they in any case until we know by actual experience that they have the ability described above.

To these men we accord the highest wages paid in the division, with the exception of those of the chief operator and his assistant, and we make them uniform in all power stations of the system. By this method of making men fit the position before they occupy it, we secure the ability we desire, and after it has been proven beyond doubt by a previous practical experience. It is, in my opinion, a serious mistake to class men alike for the sole reason that they have worked practically side by side on the system for a period of time. I say, pay the man in accordance with what he can deliver to you in brains or manual labor equivalent. I admit that the man who can not deliver the first-named portion of a working man's capital, and won't deliver the last item, may conclude to get off the pay-roll and identify himself with some organization or other which may demand that all of its members receive the same wages. If he does this, it is his affair; but we can not afford to pay the same price for ignorance and neglect that we can for ability, aided by push and a desire for further knowledge. In making this statement I do not mean to cast any reflection on a man that may have less ability than others, but instead to speak from a purely business point of view, and I repeat, that the chief operator when hiring men should be particular to move along the best ones, and be still more particular when he takes in his green workmen to observe to the best of his ability, and satisfy himself thereby, of the apparent future value of the men. This is the proper method to adopt in order to keep the organization up to standard; that is to say, it is the proper beginning, and let it extend down to the end of the line, even to the cleaners, for there are good cleaners and bad ones, especially on electrical machinery.

Storage-Battery Division.—Of the organization to operate storage batteries, I will say I believe that the cheapest man to have at the head is one who is both technical and practical in that line of work, and that he should be possessed of the same qualifications as are necessary in other heads of divisions with reference to handling men; but there is this to add, that it is seldom that men will work in the general line of storage-battery repairs for any considerable length of time, in that such work is not of the sort that attracts the average man, and they do not stay long enough to actually show of what value they might be after a reasonable period of service.

Head of Department.—I have refrained from speaking of the head of the generating system and the assistant to that person, for the reason that it seemed to me proper to look over what there was in the nature of organization and operation that the head and his assistant were called upon to look after. I now say that the head of the department has responsibilities as follows:

The very important one of the organization of his department. If that be correct, or as nearly so as conditions will permit, the operating responsibility, broadly speaking, will not seem as serious to the head of the department as it would under the more unfavorable condition of lax discipline in the handling of heads of divisions and men who have severally decided that the head of the department is in his position for the sole purpose of bearing his title instead of directing the operation of the generating system. He should not only pass his orders on operation to his assistant, but in addition should see to it that they are carried out. He should carefully observe the result, and be ready to devise, if possible, methods of saving to his several accounts, as the total of these will represent his total generating cost. He should not, however, overdo the looking after of small details, because he has an assistant and several heads of divisions, who occupy positions and are paid salaries for the purpose of looking out for that portion of the business, and if they don't do it and relieve him in that direction, then either the organization or the discipline or both are not correct, and it is absolutely useless for him to expect to proceed on a successful basis until his own error, whether caused by neglect or otherwise, is corrected, and his people understand in a thorough manner that the head of the department is there to direct its operation.

The head of the department should also keep in touch with the intentions of his heads of divisions relative to their hiring of men, and not only confer with them in a general way on such matters, but lay down a rule that men connected in any way with matters detrimental to the interests of the corporation should not be hired in any event. He should include in such a rule a stipulation that if men of such type get inside the organization notwithstanding proper precaution has been taken, they should be relieved from further connection with the department at once and be replaced by men of a different class.

I have found by some years of experience that to pay one line of work a standard wage, whether it be lower or higher than the so-called "union" scale, is productive of more contentment and better sentiment toward the employer than anything else I know of; but in order to do this consistently we must, as I have mentioned before, be careful to select a class of men who are very nearly alike with reference to the amount and quality of work which they can perform. Such a thing can be done easily, as I know by actual experience.

It does not seem necessary to say that the head of the department should not absent himself from the system or from his office for any length of time without giving notice where he can be found in case of emergency, and the assistant and heads of divisions should be required to observe the same rule; for while such a rule may seem to be somewhat of a hardship at first, on second thought we can easily imagine cases where it would be most unfortunate not to be able to avail oneself of the services of one of the best men in his department just because one is unable to locate him; and besides, such a rule removes any chance of inference being drawn detrimental to the man.

The head of the department has at times to go farther than his office to get at the reason of the rise in some account which seems abnormal. He must, after exhausting other methods, simply get in and dig it out; get the reason, and see if it is a proper one, and if not, apply the remedy. If the reason is proper he is entitled to rest content, because he has assured himself that the rise in the account is not the result of reckless expenditure; if he finds a poor reason, he will strengthen his organization by taking the matter up with the proper party and going into it in a manner that can not be misunderstood, and show where it is to the advantage of all concerned to make that expense nearer the proper amount.

It sometimes happens that difficulty occurs between some of the men and their superior, in which the man from the ranks feel that he has been misused; that his superior has been too hard on him because his advantage of position has given him the privilege. In such cases, after the man has taken his trouble to the chief of his division and even then feels that he has a grievance, I believe it to be good policy to allow him to see the head of the department as a last resort; for the head to call in all parties concerned at one time and hear the several stories, one at a time, and decide the matter. Of course, if the superior has used his position properly there can be but one result; if he has not, and you have to decide the man is not to blame, then be sure you have that man understand beyond a doubt that he can not and must not mistake a just decision for a license to disobey in the future, but that he is bound to work for and obey the same superior, just as much as he was previous to the time when the difficulty occurred.

It therefore seems that there are a good many places where the head of the department can put in his services and benefit the organization, and if he can find the necessary time to walk out and through his system, even though he does not speak at all, no doubt he can see spots that will bear criticism, and it is for him to note them and, as I said before, "apply the remedy."

For the head of a department to say to himself, "We are now organized and operating satisfactorily, there is nothing more in that line at present," is a rash statement even to himself, as he will soon find out if he does not watch what he has tried to put together so carefully. To watch the organization, and constantly, too, is what is in a large degree necessary to the attainment of a low cost per kilowatt-hour.

Assistant Head of Department.—And now about the assistant to the head of the department. We will assign to that individual the duty of placing with the heads of the several divisions the orders given by the head of the department. We will ask him to see that the electrical instruments, steam gauges, and all other indicating apparatus, are kept at proper standard; to know whether the engines have been indicated; to keep in touch with the load, and the time of demand for the same, at its highest point and its lowest point as well, and thereby be enabled to suggest the advisability of changing the load from one station to another, with a view of obtaining the best economy possible with the fuel and water consumed and the expenditure for labor; to check the amounts of fuel consumed; to check and comment on the grade of fuel and kick on the quality if necessary.

The assistant to the head of the department must necessarily be a man of technical ability and be able to take up the items heretofore set forth on that basis; for among the many small items, which when taken as a whole tend to lower the economy of operation, there are usually many that require analysis, and such analysis calls for the services of a man who is well versed in technicalities and who can get down to the bottom facts of such matters easily and quickly and open the way to apply the proper remedy.

He will also act for the head of the department in his absence, and follow closely and report any irregularities in operation of machinery or labor; and it is the duty of the head of the department to invest his assistant with such authority as will enable him to perform such duties in a clear and intelligent manner, with the only stipulation that his treatment of all the parties concerned shall be of a kind that will stimulate good feeling in the department and at the same time not interfere in any manner with good discipline.

In fact, the duties of the assistant to the head of the department are manifold, and of great value if properly performed. He is in his position the second in the amount of responsibility taken, and should most fully realize it and endeavor to protect that position with his ability to look into the future far enough to warrant that the service of the company will not suffer and that the expenditure made to manufacture the output will be as low as is consistent with good service and operation.

In the foregoing matter I have endeavored to place before the association an outline of the generating department organization of the Boston Edison Company; and, finally, I wish to say that whatever success we have attained in this direction has been due to efforts to secure a close and constant co-operation throughout the department; to the maintaining of a discipline which has been necessary and warrantable, but which has been established and maintained with justice and tempered by kindness. In other words, there has been the disposition on the part of the company and of the department to show every employee that his position had a value both to the company and to himself; to show that the value of the position to the employee was what the employee himself could make it, aided by the counsel and instruction of the superior who held his services in immediate charge; and to show that by paying a uniform rate of wage for a uniform quality and quantity of labor in every line, the company had adopted a treatment of its men conducive to contentment and, was reasonable in assuming and expecting it.

AN ELEVATED RESERVOIR of unique construction has been built at Bochum. Outwardly it looks like a handsome office building 27 x 21 m. in plan and four stories high. Inside, however, it contains steel basins in the upper two stories, having a total capacity of about 3,000 cubic meters.

Efficiency Tests of a 400-Kw. Westinghouse-Parsons Turbo-Generator.

Some interesting tests of a 400-kw. Westinghouse-Parsons turbo-generator of standard construction, installed in the mills of Joseph Benn & Sons, Providence, were recently made by Messrs. F. P. Sheldon & Co., mill architects, of that city. The object of the tests was to specifically determine the fulfillment of the builders' guarantee of the steam consumption at various loads and under various conditions, and incidentally to observe the general sufficiency of the steam turbine for its intended work.

It was particularly desired to determine the efficiency of the turbine independent of the generator; consequently separate tests were made on the steam turbine and the generator. To insure the utmost accuracy brake tests were made on the turbine. The exhaust steam from the turbine was condensed in a surface condenser and the condensed steam weighed.

The method of conducting the tests and the details concerning the calibration of instruments, methods of measurement, etc., were as follows:

Methods of Testing.—In general, the method employed in testing the steam turbine conforms to the A. S. M. E. standard code, but departs in some particulars owing to the somewhat different problems involved in turbine construction.

Steam was furnished from a boiler plant located at some distance; tests with dry saturated steam were, therefore, run with the aid of a superheater because of the large amount of condensation taking place in a long steam pipe line; thus dry saturated steam was delivered to the turbine. As this superheater was fired by natural gas, the steam temperatures were maintained constant.

Exhaust steam was condensed in a surface condenser of the counter-current type, equipped with a two-stage rotative dry-air pump and an independent hot-well pump which later discharged the condensed steam directly into a pair of weighing tanks.

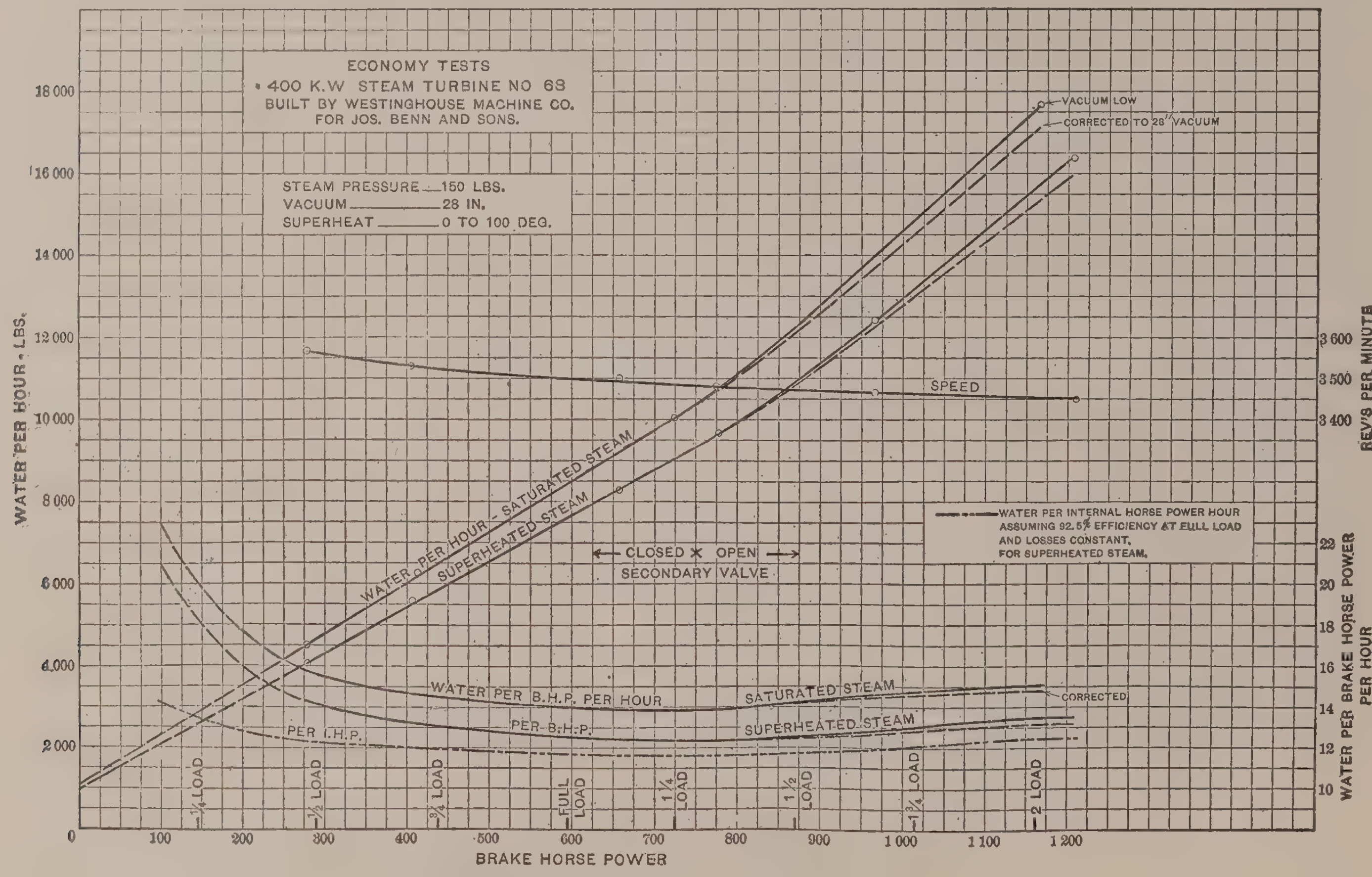
The water absorption brake used operates upon the principle of the Prony brake, and results are computed in the same manner. Its brake arm terminates in a roller bearing upon a block supported by a platform scale. Previous to the test the eccentric weight of the brake arm was determined by balancing the brake on knife edges, this weight (about 48 lb.) being finally deducted from the observed thrust to determine the net torque developed.

Calibration of Instruments.—All gauges, thermometers and scales used in the test were carefully calibrated to insure accuracy; the pressure gauges by actual test throughout their working ranges on a Crosby gauge tester, the thermometers by immersion in steam of known pressure and temperature, and the scales by checking with a set of standard weights.

Methods of Observation.—Steam pressures at the turbine were determined by a gauge attached close to the turbine throttle; exhaust pressures, by compensated mercury column attached to the exhaust end of the turbine; temperatures of steam delivered to turbine, by thermometer immersed in oil cup at turbine throttle; superheat calculated from difference between observed temperature and temperature of saturated steam corresponding to the observed pressure; speed, measured by a reciprocating speed counter connected to the reciprocating governor motion which is geared to the turbine shaft; steam consumption, determined by weighing the water of condensation from the condenser hot-well by the alternate method at intervals of five or of ten minutes. As the load upon the turbine was maintained practically constant, the amount weighed during these intervals would also have been constant except for the following corrections:

(a) Condenser leakage, determined immediately before and after regular test by closing all valves leading to the steam space of the condenser and placing the condenser under the same vacuum as obtained during tests. The amount of circulating water which then reached the condenser hot-well represented the actual condenser leakage, which averaged about 5 lb. during an hour's test. (b) Gland water used for sealing the packing glands at the two ends of the turbine casing was weighed at ten-minute intervals previous to its passage through the glands. As this water is finally drawn into the exhaust passages it was deducted from the total water condensed. (c) Height of water in hot-well, from the known dimensions of the condenser hot-well, the weight of water per inch of depth was calculated. The difference in height at the beginning and ending of the test was noted and the equivalent weight allowed for in the final weight of steam.

These three corrections applied to the total weight of water at the end of the test gave the net weight of steam supplied to the turbine during each one-hour run. Had the same corrections been applied at ten-minute intervals, these weights would have been approximately constant. How little variation actually occurred is shown in the curves plotted from the log of eleven tests.



Performance Chart of 600 Horse-Power Steam Turbine.

The logs of the electrical performance of the unit were similarly complete, but are not reproduced here, although given in the report.

Results.—The results of these runs are combined on the chart of the turbine's performance at different loads and with both saturated and superheated steam. Messrs. Sheldon state that the tests have shown the turbine capable of carrying great overloads, and call attention to the extraordinary overload of 108 per cent. which was carried by the turbine with excellent economy. This desirable feature is brought about by an automatic secondary governor valve with which the turbine is fitted, which valve begins to operate only when the load on the turbine has reached about 700 h.-p., or about 15 per cent. overload. This feature is valuable, as it permits the turbine to operate at its best economy at or near full load, and it provides means for sustaining large overloads.

The governor of the turbine is so constructed that its sensitiveness may be altered within broad limits. This turbine unit is intended ultimately to operate in parallel, and therefore required a speed regulation at or near 4 per cent. A governor test was run with the following results:

Load.	R.P.M.	R.P.M. variation.	Per cent. of Variation
0	3,620	+124	+3.55
1/2	3,541	+ 45	+1.29
Full	3,496	0	0
1-1/2	3,460	— 36	—1.03

Extreme variation, ½ to 1½ load, 2.32%.
Extreme variation, 0 to 1½ load, 4.58%.

The construction of the governor, however, permits much closer regulation to be obtained if necessary than shown in these tests.

Observations during the regular load test follow:

Load	R.P.M.	R.P.M. variation.	Per cent. of variation normal.
1/2	3,559	+ 59	+1.69
Full	3,500	0	0
1 1/2	3,475	— 25	—0.71
Twice full	3,450	— 44	—1.26

Extreme variation, ½ to twice load, 2.95%.

These results are shown in the speed characteristic curve on the performance chart and are somewhat better than the governor test.

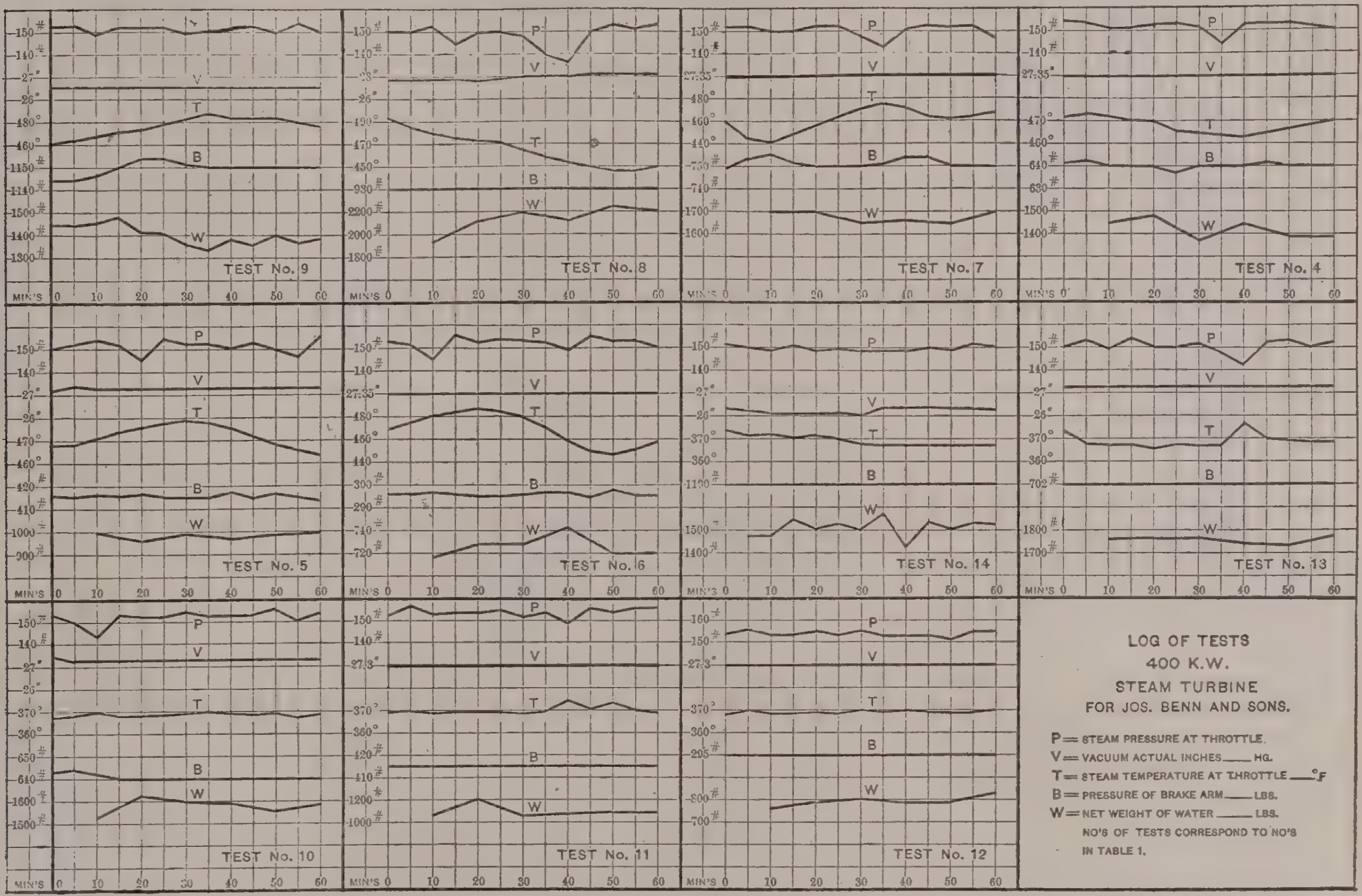
The effect of superheated steam upon turbine economy is well indicated by the divergence of the two water lines corresponding to the tests with saturated and superheated steam. This divergence is practically uniform. Expressed in approximate terms, the results of these tests indicate that the steam consumption is reduced 10 per cent. per 100° F. superheat throughout the range of tests.

Conclusions.—The tests show a high efficiency in the use of steam, generous overload capacity and close speed regulation, Messrs. Sheldon report. The builders' guarantee of economy was made under 165 lb. gauge pressure at throttle. The tests were made under 150 lb. pressure, and as the results are over 10 per cent. better than the guarantee, it is reasonable to suppose that if the required steam pressure had been available the guaranteed economy would have been exceeded still more. Under test the turbine showed the remarkable overload capacity of 108 per cent. at a very slight diminution of the full load economy, viz: about 6 per cent. The speed regulation of the turbine is stated to be all that could be desired, and its operation indicates it is well adapted to the requirement of electric drive for the textile mill.

Book Notes.

Prof. A. F. Jorini has written a book on bridges which is interesting as indicating the character of the instruction in the Milan Technical School. It is entitled "Teoria e Pratica della Costruzione dei Ponti," and discusses timber, steel and masonry construction. It is a comprehensive statement of the elements of this branch of engineering, the section on masonry bridges probably being the best. The book is largely in harmony with current German opinions. (Milan, Ulrico Hoepli; paper, 8vo, 12 lire.)

For some reason the elements of rational mechanics are not taught in technical schools until after the student has acquired a knowledge of calculus. Although in its elementary form the subject is readily grasped and should become a part of the undergraduate's store of information as soon as possible, it is not taught until late in his course and is then shrouded in so many mathematical formulas that its importance is not recognized. Inasmuch as rational mechanics is one of the fundamental subjects on which engineering rests, this method of teaching it is manifestly wrong. That a pretty good working knowledge of it can be obtained without using calculus is shown by Prof. Mansfield Merriman's "Elements of Mechanics." In forty lessons he provides a basis on which instruction in applied mechanics can safely stand. The mathematical knowledge required to read the book includes only plane geometry, elementary algebra and plane trigonometry. In order to fix the subject in the student's mind there are a large number of numerical problems to be solved, and as such computations afford the best method of securing familiarity with mechanics, they are a particularly useful feature of the book. (New York, John Wiley & Sons; cloth, 16mo, $1.)



Curves Plotted from Log of Eleven Tests of 600 Horse-Power Steam Turbine.

The March "Bulletin of Bureau of Labor" of the U. S. Department of Commerce and Labor contains two interesting papers, one on the course of wholesale prices in 1890-1904 and the other on street railway employment in this country. The first is an amplification of the tables previously issued by the Bureau, covering about 260 products of widely varying character. The second, by Dr. Walter E. Weyl, is a report of his studies of a field of work in which about 140,000 men are employed, almost one-eighth as many as are engaged on steam railroads. About three-fifths of this number are motormen and conductors, who work 9 to 13 hours a day. The author's summary of his studies is as follows: "It would appear that as a result of the development of the last 15 years, and as a consequence notably of the introduction of electric traction, the great body of street railway employes is being converted from a loosely aggregated, fluctuating, constantly changing body of unskilled, untrained men, working excessive hours for inadequate pay, under extremely vicious conditions, into a more compact, coherent and regularly employed body of men, earning better wages and working shorter hours under improved conditions. The development has manifested merely a tendency in the direction of amelioration and it cannot be regarded as a completed process."

A bibliographic review and index of information published concerning underground waters by the U. S. Geological Survey between 1879 and 1904 has been compiled by Mr. M. L. Fuller. About 1,500 papers have been examined in this work, and there are about 600 titles in the bibliography. In preparing the index two distinct classes of readers were kept in mind, the first including those who are interested in some particular type of ground water or in one or more of the many problems of ground-water occurrence. For the benefit of the first comprehensive entries are given under states and other political or natural divisions, while for the benefit of the second are given the numerous subject entries. The aim has been to assemble the latter entries into comprehensive groups, each including reference to papers containing material bearing on the subject of the group. The state entries will be found the most complete, as they include many which it is impossible to satisfactorily classify. The pamphlet is issued as No. 120 of the "Water Supply and Irrigation Papers" of the Survey.

EARTH AND ROCK EXCAVATION. By Charles Prelini. New York, D. Van Nostrand Co.; cloth, 8vo, 343 pp., $3.

Two quotations from this book will enable the experienced reader to judge its character. In speaking of earthwork the author says: "In the United States no attention is paid to the distribution of volumes along the line, either in public or in private works. As a consequence the mean distance of haul is not known, and earthwork is never calculated on scientific principles in the United States. The author being aware that even the United States Engineer Corps, which is in charge of all works executed by the Federal Government, did not consider this factor, requested the Chief of Engineers to explain the reason for this important omission, and received the evasive answer that he was sorry that he had no printed matter for distribution dealing with this subject." The second quotation, on the subject of rock drills, is as follows: "Notwithstanding the success obtained by electric drills in mining operations, they have not yet been introduced in public works. The writer has openly complained in 'Engineering' that the contractors of the New York subway did not care even to give a trial to electric drills. By their use the cost of excavation would have been greatly reduced and the contractors could have realized greater benefits. It seems that prejudice affects some contractors so deeply as to prevail in conspiring even against their own pockets."

The value of the book to American readers lies chiefly in the information it gives concerning foreign methods, although some of the data relating to the equipment built in this country for heavy work are presented in a way that may prove useful. It is a curious mingling of practical and impractical ideas, which may have much value to experienced men, but are likely to mislead others who consult some of its sections.

STEAM PIPES: THEIR DESIGN AND CONSTRUCTION. By Wm. H. Booth. New York, Norman W. Henley Publishing Co.; cloth, 8vo, 200 pp., $2

Although there are a number of good books on steam boilers, there are very few on steam piping in all languages taken together. Until very recently piping was designed on the basis of experience mainly, and in order to avoid shutdowns it was customary to provide duplicate pipe lines. Within a few years this has been changed materially. The sizes of steam pipes have been reduced, the joints have been improved and various standards have been adopted to secure much needed uniformity. The time is ripe for a book on the subject, giving a review of what may be considered standard practice, and such a book Mr. Booth has provided. It explains the current theoretical and empirical formulas for the flow of steam in pipes, discusses the materials used for such mains, explains various methods of providing for expansion and has chapters on anti-priming pipes, joints, hangers and supports, valves, traps, separators, installation, general arrangements of piping, superheating and associated subjects.

The book is primarily for British readers and most of the illustrations refer to British steam specialties. The author is well acquainted with American standards, however, and frequently refers to them, so that the book is as useful to American as to other engineers. It is essentially a compilation, as is necessarily the case, and in a few respects the compilation leaves something to be desired. For example, the prominence given to Prof. Norton's tests of pipe coverings is hardly warranted by their usefulness, for the test of a pipe covering in actual service imposes conditions which were not met in those experiments, valuable as they were. Again, in the discussion of piping for superheated steam little is said about the selection of valves for such service, although this matter is receiving the earnest consideration of many engineers and manufacturers. Other instances of this nature might be cited, but they do not detract appreciably from the usefulness of the book to most engineers.

Letters to the Editor.

Engineers and Contractors.

Sir: In looking over specifications for street paving about to be let I notice the following clause: "Contractors will be required to know that all estimates, grades and stakes are correct, and no error on the part of the engineer or any previous contractor will relieve any contractor from this responsibility or be considered as grounds for claims against the city or property owners." It seems to me that under this clause the contractor would be compelled to employ an engineer to check grades and lines given and to examine the records to determine what grades were established. F. G.

[This is a subject that has been bandied about for years. Street lines and grades can only be given by the engineer, and it is wholly wrong to require the contractor to be responsible in any way for them. Nevertheless, a few engineers have so little confidence in their ability to discharge their duties properly that they insert such clauses in their specifications, where they certainly do not belong.]

Design of Arch Culverts.

Sir: In your issue of April 15 Mr. Barlow gives as his reasons for battering the bench walls of concrete culverts the doubt as to direction of resultant of thrust and earth pressures and the necessity for expanded footings, adding that he deems neither of these considerations as of much importance. Then, he continues, "the principal reason for battering the side walls is to avoid the angles and shoulders which would otherwise have to be built at the ends of the barrel, provided we secure a batter on the wing walls."

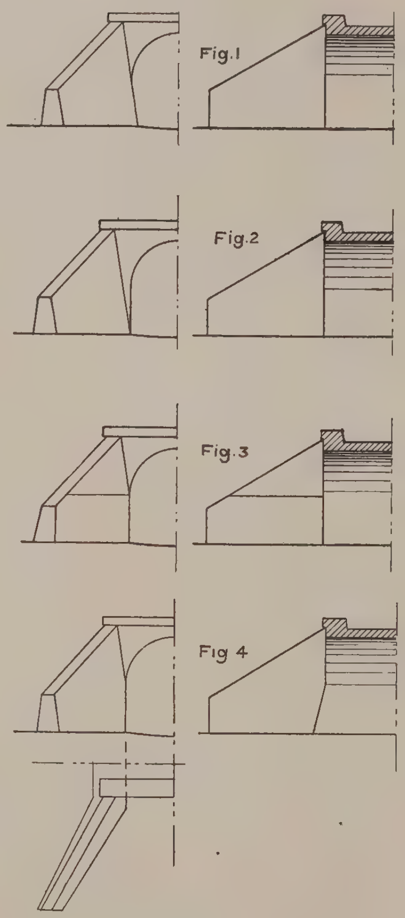
That the two first-named considerations are not important is apparent, I think, because expansion of the footings might as easily be secured by additional batter at the back of the wall, and because the doubt as to resultant could easily be eliminated by designing with lower bench walls, at the same time increasing the capacity of the arch for the same waterway area. This has since been suggested by Mr. Campbell in your May 13 issue.

To Mr. Barlow's principal reason for battering the bench walls I wish to take exception. I think the shoulders objected to may be avoided by a much better solution than the one used in Mr. Barlow's design on the Western Maryland R. R. Solutions that to me appear much more reasonable have so often been given in textbooks that I have wondered why engineers persisted in using the unsatisfactory methods, and this is what led to my inquiry for Mr. Barlow's reasons.

I present herewith Figures 1 to 4 showing possible solutions of the joining of battered wing walls to arch spandrels. In these drawings the batter has been purposely exaggerated, and no attention has been given to details not bearing on the particular problem in hand.

Fig. 1 is the form shown by Mr. Barlow's drawings.

Fig. 2 shows the wing with the line of junction passing through the foot of the bench wall, producing the awkward shoulders referred to by Mr. Barlow as his reason for preferring the form of Fig. 1.



Types of Railway Culverts.

Fig. 3 shows the line of junction passing through the springing of the arch, the part of the wing above the springing battered and the part below the springing vertical. In Figs. 1 and 3 the bench walls are vertical.

These three forms appear to me to have objectionable features: In Fig. 1 the inclined bench walls restrict the waterway at its most vital point, call for increased material without, I believe, any increase in strength; Fig. 2 has objectionable shoulders at entrance of waterway, obstructing flow and requiring added expense in forms; Fig. 3 is unsightly and wasteful of material in wings.

What seems to me to be a far more reasonable solution is that shown in Fig. 4, in which the wing wall is battered, yet passes through the springing avoiding the shoulders of Fig. 2, and with vertical bench walls for the arch. The only difference between Fig. 1 and Fig. 4 is that the material between a vertical bench wall and the inclined bench wall has been cut away, eliminated, the plane face of the vertical bench wall being produced to its intersection with the battered face of the wing. For form erection this design is no more complicated than that of Fig. 1, since it consists simply of a vertical bench wall, vertical face of spandrel and a face of wing having a specified batter. The carpenters have only to produce these faces to their intersections.

For the sake of appearance, it is frequently desirable to batter the side walls of piers, but the batter should be extremely slight, sufficient only to satisfy the eye.

The detail under discussion may seem insignificant, but in this particular case it would have saved an actual loss of over $100 of concrete. Moreover, it would have increased the waterway at its most important point; that is, where head is greatest. Engineers accustomed to girder construction almost always make objection to the arch that its waterway is decreased by its curved haunches; yet the curved haunches decrease the waterway only where the head is slight, restricting the passage at its least important point. An A-shaped opening is always more effective than a V-shaped waterway, except for slack water. Maximum span at lowest elevation is all important in the handling of floods.

Very truly yours, Daniel B. Luten.
Indianapolis, May 27.

Pressure in Gas Mains.

Sir: I have read with considerable interest your article in the issue of May 20 on pressure in gas mains and thought it might possibly be of interest to you to know that the suggestion embodied in the last paragraph of that article is and has been in successful use in two large plants in this country for several years in almost exactly the way you indicate as a possibility.

The Milwaukee Gas Light Co. four years ago installed an auxiliary system, which we called a "booster" system, consisting of independent mains through which gas is pumped by gas engines and positive blowers at any pressure required. These mains connect to the regular distribution system at intervals, a governor being inserted at each point to control the pressure of gas on the low-pressure or distribution system proper. The experimental installation was so successful at Milwaukee that the Laclede Gas Light Co., of St. Louis, two years later installed a similar system on a larger scale.

The Milwaukee system since its first installation has been developed until now at the peak hours three-quarters of all the gas sent out passes through the "booster" mains, while at other hours less than one-half passes through the "booster" mains, and that at holder pressure only. Thus the power required is extremely small compared to the total sent out.

This arrangement also allows of the tieing together of different plants and outlying holders. The installation of a pumping station anywhere on the gas lines, preferably at the holders, becomes extremely simple with gas engines, and the man who would ordinarily take care of the governor can attend to the gas engine pumping station without additional expense.

Yours truly, Milwaukee Gas Light Co.,
Milwaukee, May 27. R. B. Brown, Eng.

The Tie Problem on American railways is fast becoming as much a matter of securing as preserving the ties. At the recent meeting of the American Forestry Association, Mr. Joseph T. Richards, chief engineer of maintenance of way of the Pennsylvania R. R. Co., stated that his company now had about 280,000 seedlings growing for tie purposes.

CURRENT NEWS SUPPLEMENT

JUNE 10, 1905.

DIRECTORY OF NATIONAL TECHNICAL SOCIETIES.

American Society of Civil Engineers. Secretary, Chas. Warren Hunt, 220 West 57th St., New York. Annual convention, Cleveland, June 20-23.

American Society of Mechanical Engineers. Secretary, F. R. Hutton, 12 West 31st St., New York.

American Institute of Electrical Engineers. Secretary, Ralph W. Pope, 95 Liberty St., New York. Annual convention, Asheville, N. C., June 19-23.

National Fire Protection Association. Secretary, W. H. Merrill, Jr., Chicago.

American Institute of Mining Engineers. Secretary, R. W. Raymond, 99 John St., New York.

American Institute of Architects. Secretary, Glenn Brown, Washington, D. C.

Association of Engineering Societies. Secretary, Frederick Brooks, 31 Milk Street, Boston, Mass.

American Society of Heating and Ventilating Engineers. Secretary, W. M. Mackay, 235 Water St., New York. Annual meeting, Chicago, July 7 and 8.

Canadian Society of Civil Engineers. Secretary, Clement H. McLeod, 877 Dorchester St. Montreal.

Society for the Promotion of Engineering Education. Secretary, Prof. M. S. Ketchum, University of Colorado, Boulder, Colo. Annual meeting, Atlantic City, N. J., June 28 and 29.

American Society for Testing Materials. Secretary, Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa. Annual meeting, Atlantic City, June 29-July 1.

American Society of Municipal Improvements. Secretary, George W. Tillson, Room 12, Municipal Building, Brooklyn, N. Y. Annual meeting, Sept. 5-9, Montreal.

Association of Railway Superintendents of Bridges and Buildings. Secretary, S. F. Paterson, Concord, N. H.

American Railway Engineering and Maintenance of Way Association. Secretary, L. C. Fritch, 1562 Monadnock Block, Chicago.

American Water-Works Association. Secretary, J. M. Diven, Charleston, S. C.

American Foundrymen's Association. Secretary, Richard Moldenke, P. O. Box 432, New York.

Engine Builders' Association of the United States. Secretary, J. L. Lyle, 39 Cortlandt St., New York.

American Public Works Association. Secretary, W. H. Flint, Chattanooga. Annual meeting, Chattanooga, Aug. 30-31.

NINE-FOOT VALVES FOR THE ONTARIO POWER CO.

Some 9-ft. gate valves, a photograph of one of which is herewith reproduced, are now being installed at the plant of the Ontario Power Co., Niagara Falls, described in this journal on Oct. 8, 15, 22 and 29. Six of these will control the flow of the water from the main 18-ft. conduit to the 9-ft. vertical penstocks which descend through shafts and tunnels to the turbines at the power house below. The penstocks take off from the under side of the conduit, and the valves are placed in a chamber beneath the conduit just below the taper connecting section, 9 ft. below the conduit. The placing of the valves on the under side of the conduit was necessary on account of the very limited space, and since the conduit is laid in the Queen Victoria Niagara Falls Park, it will be covered with earth. The housings and operating mechanisms are in arched chambers under the conduit, access to which are had through shafts coming to the surface of the ground alongside of the conduit. All six of the valves have been received from the makers, Ransomes & Rapier, London, England, and are now being set in place.

The casings of these valves are rectangular in shape, and made of steel plates heavily reinforced with angles. For convenience in handling they are made in three parts and bolted together so they may be easily assembled and taken apart. A partition through which the gate slides, divides the casing in the middle. When the gate is fully open, a door carried by the gate closes the opening in this partition, thus making water-tight the half of the casing into which the gate is drawn. The water may be drained off from this half through a 6-in. valve in the bottom and the gate itself examined through a manhole without interrupting the flow of water through the penstock. The gate or paddle is fastened to the water-tight door by rods through compressed helical springs. The nuts may be taken off the ends of the rods and the door left in place while the whole gate and end of the casing with the operating mechanism attached, is removed for attention or repairs. After replacing the gate and end, and before removing the water-tight door, the casing is filled with water through a 2-in. pipe connecting with the penstock.

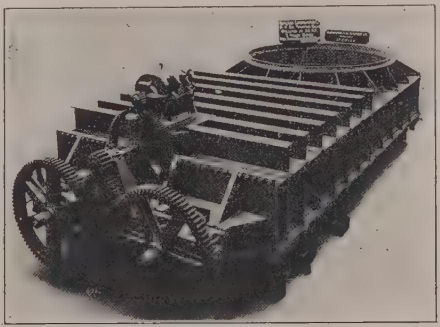
The paddles of the gates are made of steel plates and sections bolted securely together; auxiliary sluices in each gate serve the purpose of a by-pass. The gate is moved by two block nuts running on screws, and these nuts are fastened to the sides of the auxiliary grid sluices so that upon opening, the first 3 in. of movement of the block nuts open the by-pass and upon closing, the first movement closes them again.

The screws are driven by a geared 30-hp. electric motor, which opens the gate in three minutes. The thrust of the screws is taken on ball bearings, and the block nuts and sliding surfaces are lubricated by compression grease cups.

The head upon the gates is 50 ft., equal to a total weight of 124 tons, and each gate controls the flow to one double-spiral turbine of 11,390 h.p. capacity using 700 second-feet of water.

A NEW GAS PRODUCER AND GAS ENGINE.

Realizing the advantages of the suction gas producer and internal combustion engine equipment for the production of power in the medium and smaller sizes of units, the Minneapolis Steel & Machinery Co., Minneapolis, Minn., is preparing to build power apparatus of this type, having secured the sole right to build the Munzel engine and producer in North America from its originators, the G. Luther Company of Brunswick, Germany. Mr. Munzel, the designer of this engine, was associated with Dr. Otto in the early investigations and development of the original Otto engine and was for twelve years general manager of the Otto Engine Works at Cologne-Deutz. For the past five years, however, he has been connected with the Luther Co., during which time the Munzel engine and producer have been perfected and large numbers of them installed.



NINE-FOOT PENSTOCK VALVE.

The equipment to be manufactured will follow the lines of that of the Luther Co. very closely, original drawings and designs having been secured together with the advantages of the extensive experience of the latter company in the manufacture and installation of this class of apparatus. In this way the uncertain and indefinite results of developing an entirely new design are avoided and the Minneapolis Co. will be enabled to offer a well-tested power equipment at the outset. The engine cylinder is cast integral with the frame and bed plate, and is of rigid construction. The working cylinder consists of a liner or shell, the annular space between which and the outer cylinder forms a water-jacket for the cooling system. The cylinder head contains the mixing chamber and the valves and is thoroughly water jacketed. The valves are of the usual lift type, operated by cams from a secondary shaft. Each valve and its stem are one solid piece of steel, forged from steel bar and finished in the lathe and grinding machine. In the larger engines the exhaust valve and stem are made hollow and are water-cooled.

The crank shaft is provided with three bearings, in this way avoiding the use of overhanging flywheels. The main bearings are provided with ring oilers and large oil cellars, insuring a constant flooding of these bearings. All bearings are fitted with loose shells, lined with best antifriction metal.

The governor, which is of the centrifugal type, is sensitive and keeps the engine under absolute control from no load to about 10 per cent over the normal load, the ultimate capacity of the engine. It controls the amount of explosive mixture admitted to the cylinder, this method of governing giving an explosion every cycle, but varying the intensity of the explosions to suit the load. It also gives a much more regular motion than the "hit and miss" method, and by varying the amount of the mixture instead of varying the amount of gas only, keeps the quality of the mixture constant and insures both the economy and good regulation of the engine.

The producer equipment consists of the usual form of small furnace, having on top a hopper for the introduction of the fuel, and immediately over the fire, an evaporator wherein is generated the steam at atmospheric pressure for mixing with the air that is to be drawn through the fire, by the sucking action of the engines, to produce the gas. After leaving the producer, the gas passes through a water bath into the lower part of the washer or scrubber. This scrubber is kept nearly full of coke and a fine spray of water is introduced at the top, which trickles down through the coke while the gas is being drawn upwards, intercepting any dust or other impurities in the gas.

A small hand fan is attached to the producer for the purpose of hastening combustion when starting a new fire, as on Monday morning, and also for quickly producing gas to start on any morning after banking the fire at night. Twenty minutes is needed to produce gas for the morning start after banking, and one to one and a quarter hours when starting a new fire entirely. These producers will produce gas from anthracite pea coal, coke or charcoal, whichever may be cheapest in the market where the power is required. The use of the gas producing plant most effectually disposes of the smoke nuisance, as it does not produce any; the gases produced by combustion are all passed directly to the engine.

MEETING OF CEMENT BLOCK MACHINERY MAKERS.

In the past two months letters have been sent out to all the manufacturers of cement block machines with a view of getting them together and forming an association. They have replied favorably and the meeting will be held at the Great Northern Hotel, Chicago, June 27 and 28 for this purpose.

From the information that has been received by the organizers of the meeting, they feel assured of the earnest co-operation of all the manufacturers, as an association of this kind is a necessity. There has never been one organized, and the business has now become so large that the time has come when the machine men must get together and talk matters over, the same as members of other industries. A very large attendance is expected and the session will probably be interesting and beneficial.

PRIZES FOR PAPERS ON LIME PLASTER.

The National Lime Manufacturers' Association offers two prizes, one of $100 for the best paper, and the other of $50 for the second paper on the subject of lime vs. plaster. It is desired in these papers to present the best truthful arguments in favor of the use of lime, either directly as a lime plastering mortar or indirectly by its use in large quantities in a hydrated form in prepared plasters. Results based on practical work and giving good working formulas with reference to points, where they have been used, etc., will add mostly to the value of such papers.

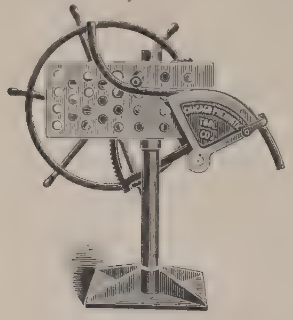
The best two papers are to be the property of this association for its use in general advertising and publication, with the privilege on the part of the association to use the name of the writers if it may so desire, unless other arrangements are made. The papers not used will be returned to the writers as promptly after selection as possible.

It is especially desired that these papers shall be of as thorough a practical nature as possible, not written too much in detail, but yet giving conclusive data in confirmation of opinions expressed, and of sufficient length to make a good readable booklet of six to ten pages of ordinary size large type.

All papers must be mailed to Charles Warner, president of the association, Wilmington, Del., not later than midnight, June 30, with full name and address of writer. All papers not used will be kept strictly confidential and returned as promptly thereafter as possible.

THE CHICAGO PIPE BENDING MACHINE.

A pipe bending machine of simple construction, recently brought out by the Chicago Pneumatic Tool Co., is illustrated in the accompanying cut. Although it is not at all complicated and can be operated by a fitter's helper, pipe can be bent with it to complex curves in a rapid manner. Its light weight is also a feature to which the makers call special attention. Steel, iron, brass and copper pipe up to 2 in. in diameter can be bent cold by one man, which makes the machine desirable for works where pipe is used to any extent. It is also employed in bending light angles, flats and tees, for which purpose special dies are furnished. The makers state that where pipes are coated by the Sabin process, galvanizing, turning or the like, the machine will not break the coating. As for its capacity, it is stated that one man can alone make an S bend in a piece of 2-in. pipe in three minutes.



THE CHICAGO PIPE BENDER.

The apparatus, it is stated, has been tested with satisfactory results in various navy yards, and the repairs when in steady use have been found practically negligible. It is not claimed to be a machine for heavy bending, but for work within its capacity it is considered unusually rapid and handy.

NEW YORK CITY SURVEYORS.

In order to make the legal status of city surveyors in New York uniform in all boroughs with the requirements in Manhattan, a committee of the Board of Aldermen recently recommended the passage of the following ordinance:

Sec. 1. There shall be so many Surveyors appointed for this city as the Board of Aldermen shall from time to time think proper.

Sec. 2. The said Surveyors so to be appointed before they enter upon the execution of said office, shall take an oath well and truly to execute the same.

Whenever in the proper administration of the duties of his office, either of the Borough Presidents may require the services of a City Surveyor in laying out and regulating the streets and roads of the said city, making surveys and maps for street opening proceedings, and laying out and surveying all grounds for the purpose of building upon, and to advise and direct concerning the same, he shall have the authority to employ such one of the City Surveyors as he may designate for that purpose.

Sec. 3. The City Surveyors employed by any Borough President shall receive compensation therefore as follows, nor shall any Surveyor's bill be paid unless the same be first certified by the Borough President so employing him: For a preliminary survey in regulating a street or avenue, or for making a country road, for the first line of levels three cents per linear foot, measuring through the centre of the street, avenue or road, and for each additional line of levels one cent per linear foot, to be measured in the same manner.

For a preliminary survey in filling sunken lots, one dollar and fifty cents per lot of two thousand five hundred square feet.

For grading, when done alone, five cents per linear foot, measuring through the centre of the street or avenue.

For grading and setting curb and gutter, when done under the same contract, eight cents per linear foot, measuring through the centre of the street or avenue.

For grading and setting curb and gutter and flagging or paving, when done under the same contract, eleven cents per linear foot, measuring through the centre of the street or avenue.

For setting curb and gutter alone, three cents per linear foot, along the centre line of the work done.

For setting curb and gutter and flagging or paving, when done under the same contract, but not in connection with the grading, nine cents per linear foot, measuring through the centre of the street or avenue.

For flagging, when done alone, three cents per linear foot, along the line of the work done.

For setting stakes, making final survey, etc., in the filling of sunken lots, one dollar and fifty cents per lot of two thousand five hundred square feet.

For fencing, including preliminary survey, three cents per linear foot.

For making a country road, ten cents per linear foot, measuring through the centre of the road.

For establishing a new grade line, one cent per linear foot, measuring along the line.

For making the necessary surveys and furnishing all necessary copies of damage maps in street opening proceedings, three cents per foot, measured along the exterior lines of the street or avenue, and along all boundary lines of each parcel included within said street or avenue lines; and for assessment lists and maps for street opening or other improvements, three cents per linear foot of map front, it being understood that the surveyor shall in every case furnish quadruple lists and maps without additional charge.

A surveyor employed by either of the said Borough Presidents to make a survey, the compensation for which is not otherwise provided for, shall receive such compensation as shall be certified by the Borough President so employing him.

Sec. 4. In all cases of street improvements, when the same is required, a projection or profile, and such drawings and calculations shall be furnished to the said Borough President as may be required by him without extra compensation.

A Surveyor shall be entitled to receive payment for a preliminary survey on the completion of the same to the satisfaction of the Borough President employing him. He shall receive payment for all other services on the completion of the work, and its acceptance by the Borough President.

Sec. 5. The amount paid for any of the services mentioned above, whenever the same shall have been rendered in relation to any improvement or work for which an assessment may afterward be made, shall be included in such assessment.

Sec. 6. A surveyor shall be entitled to receive ten dollars for every certificate for payment to a contractor on any work done by contract made upon public advertisement and letting, which shall be paid by the Borough President making the contract, and except as herein otherwise provided, no surveyor shall be entitled to any payment for a certificate to a contractor; the amount so paid for a certificate for payment shall be deducted from the payment to be made to the contractor on account of the work certified to be done.

A BRITISH TAR MACADAM MIXER.

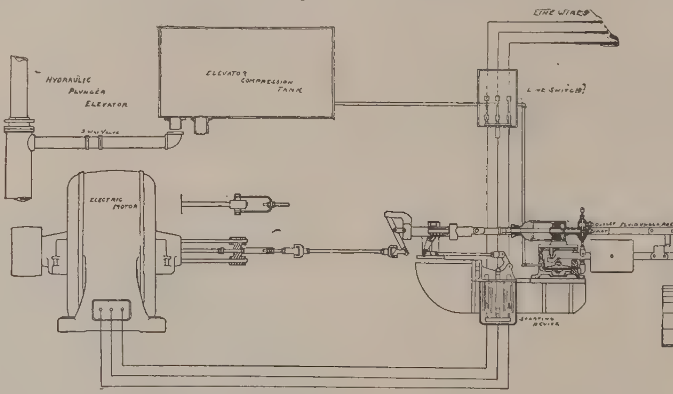
A mechanical mixer has recently been introduced by Messrs. Goodwin, Barsby & Co., Leicester, England, which is said to satisfactorily mix the aggregate and the tar used in tar macadam. The machine consists essentially of a revolving horizontal cylinder with grates beneath it, on which slow fires are maintained. The broken stone or other aggregate is introduced dry into a hopper at one end and at the same time hot boiled tar is sprayed into the hopper from a tank on top of the mixer. The mass then passes to the revolving cylinder, where it is thoroughly mixed, the fires beneath the cylinder keeping the tar sufficiently fluid to coat the stone properly. The mixers are built in several sizes, but those with 12-ft. cylinders operating at 250 to 300 r.p.m. are stated to be most widely used. This size machine is said to mix about 7½ tons an hour and to require from 2 to 3 h. p. to operate it, while small quantities of material may be mixed in it by hand power.

The new single-phase series alternating-current motor equipment of the Schenectady Ry. is described in bulletin 4392 of the General Electric Co., Schenectady. The new compensated motor used is described in considerable detail, as are also the other details required for adapting the motors for either high-tension alternating or 600 volt direct current. Wiring diagrams and characteristic curves of the motors are also given. Other General Electric bulletins received are: 4395, descriptive of type M form D-2 lightning arresters for direct current circuits; 4396, commercial-type electric searchlight projectors for marine, exhibition and special purposes; 4400, the type H subway transformers, for use in vaults, manholes, etc.; 4402, charging equipments for electric vehicles using the mercury-arc a.c. rectifier, etc.; and 4403, the new separate adjustable shunt field coil for Thomson recording wattmeters.

AUTOMATIC MOTOR STARTER FOR ELECTRICALLY-DRIVEN PUMPS.

There was recently installed by the Deane Steam Pump Co. an electrically-driven triplex pump in connection with a hydraulic plunger elevator, in one of the large business buildings in Holyoke, Mass. The requirements in connection with the automatic operation of the pump and motor were of an unusual character. The elevator is of the hydraulic type, in which the car is supported by a long plunger working in a cylinder to which water is admitted as desired from a closed tank. This tank is supplied with water by a 5x8 in. Deane vertical triplex single-acting power pump designed for a maximum water pressure of 150 lb., and means are provided for automatically stopping and starting the pump to maintain a constant pressure in the tank between certain fixed limits. The pump is connected to a 15 hp. General Electric induction motor operated by three-phase, 60-cycle, alternating current at 550 volts. The motor has a variable starting resistance inside, which is thrown in and out by means af a sliding rod or shifter. The generator supplying the current to the motor is of such small size that it was feared that the fluctuations from the frequent starting and stopping of the motor would seriously affect the regulation of the potential of the distributing system and the above type of motor was selected as being best adapted for these conditions. In operating this motor the resistance is thrown in before starting so that all the resistance is included in the armature circuit. As the motor increases its speed, the resistance is gradually cut out by a movement of the sliding rod or shifter. In stopping the motor the current is first cut out by means of an oil-break switch and then the resistance is thrown in ready for the next start.

For operating this type of motor automatically, there was no device on the market, although many are in use for controlling the ordinary types of motor having starting boxes of the usual construction. A controlling device was therefore designed by the Deane Steam Pump Co. especially for this work, and the accompanying illustration shows this automatic controller arranged in combination with the motor and pump. A water pipe connects the elevator pressure tank with a Mason automatic belt shifter, consisting of a diaphragm chamber and a cylinder in which a piston moves. The pressure of the water beneath the diaphragm is balancer by a heavy weight and any variation of this pressure causes the diaphragm to move a pilot valve admitting water to the cylinder for moving the piston. This belt-shifter is arranged in connection with a special device, so that when the pressure in the elevator tank falls below a certain point the upward movement of the piston in the cylinder will first close a switch admitting current to the motor and then throw the resistance rod to remove the resistance. As soon as the pressure in the tank has been raised to the desired point, the controlling device operates first to open the switch to stop the motor and then to throw in the resistance by pulling out the resistance rod or shifter. This is accomplished by mounting a set of cam pawls on a slide connected with the piston of the shifter cylinder to form a ratchet which engages a cam lever connected with the switch break. The cams are so formed that the switch lever is always thrown before the resistance is shifted, no matter in which direction the piston moves.



APPARATUS FOR AUTOMATICALLY CONTROLLING ELECTRIC ELEVATOR PUMPS.

The successful operation of this device in connection with this type of motor has solved a serious problem in elevator work where the current is used for both lighting and power service and the generator is of small size. The Deane Steam Pump Co. is prepared to supply this apparatus in connection with power pumps wherever the conditions render its use advisable. Practically the same arrangement of starting device has also been applied to the General Electric Form M induction motor, having a special external resistance.

BUSINESS NOTES.

The Stanley-G. I. Electric Mfg. Co., Empire Bldg., Atlanta, Ga., reports closing the following contracts: City of Fort Valley, Ga., one 108-kw., 60-cycle, 2-phase, 2300-volt generator with exciter and switchboard, 20, 6.6 amperes, series A. C. lamps, lighting transformers, etc.; City of Hartford, Ala., one 80-kw., 2-phase, 2300-volts, 60-cycle generator, exciter and switchboard, arc lamps, lighting transformers, etc.

The Miller-Collins Co., 1133 Broadway, New York, has been awarded the contract for the steelwork on the 8-story extension to the building of the Gorham Co., 384 Fifth Ave. McKim, Mead & White, archts.; Chas. T. Wills, general contractor. Contract calls for nine tiers of beams, cast iron columns, angle iron framing, etc.

The general offices of the American Locomotive Co. and the Rogers Locomotive Works have been moved to the Trinity Bldg., 111 Broadway, New York.

Snare & Triest, 39 Cortlandt St., New York, have just received a $100,000 contract for the steel work and improvements of the Brooklyn Bridge Terminal. They have recently closed a $600,000 contract for the concrete and granite rest pier and approach for the University Heights bridge at 207th St., New York, and the general contract for the new Hoboken terminal station of the Delaware, Lackawanna & Western Railroad, which involves a large amount of structural steel, woodwork, copper and general building materials. They have just commenced the construction of a large steel and iron pier for the Cardenas & Jucaro Railroad in Cienfuegos Bay. This involves about 2,000 tons of cast-iron piles and steel superstructure and a concrete deck reinforced with Clinton wire cloth.

The Brown-Corliss Engine Co., Corliss, Wis., has just closed an order with the National Tube Co. for two 38 & 70 x 60-in. tandem compound rolling mill engines, for specially heavy work, for its McKeesport plant. It has just shipped a 32 & 60 x 48-in. combined vertical and horizontal condensing engine for the Joliet plant of the Illinois Steel Co., which was built in 90 days from the receipt of the order. It has completed the shipment of a 30 & 60 x 48-in. tandem compound engine for the Jones & Laughlin Steel Co. The company now has 26 engines going through its shops, including a 20,000,000-gal. pumping engine for Milwaukee; it has recently increased its foundry capacity and is working day and night.

The Thompson-Starrett Co., New York, reports that in Chicago work is progressing rapidly on the large group of Sears-Roebuck buildings. The foundation piers are of concrete in circular wells excavated by hand, with sectional sheeting driven inside steel rings, and carried down about 30 ft. to hard pan. Designs are being completed for the New Illinois Athletic Club 10-story building which will contain 1,500 tons of structural steel. A contract has been just received for the complete construction of the Northern Trust Bldg., which will have a 1,500-ton steel framework. The steelwork is now being erected for the addition to the Union League Club building. In New York a contract has been received for the Title Guarantee & Trust Co. Bldg., which will have twelve tiers of beams and contain about 1,200 tons of structural steel. Work has been commenced on a fireproof garage for the O. B. Potter Trust, which will have a 1,000-ton steel framework. A large contract has been received for the New York Central & Hudson River R. R. Co. power house at Port Morris, N. Y. In Brooklyn a contract has just been received for the Crescent Athletic Clubhouse with a 1,000-ton steel framework. In Washington work has advanced rapidly on the terminal station, where the structure is practically finished and the steel for the east wing is nearly all erected. In Philadelphia the power house for the Wanamaker store building is about two-thirds erected.

Dodge & Day, engineers, Philadelphia, Pa., who have for the past three years designed the electrical equipment for operating the hoisting and conveying machinery built by the Dodge Coal Storage Co., will also have charge of similar work in connection with the telpherage apparatus that will now be manufactured by the Dodge Coal Storage Co., as a result of their acquisition of the United Telpherage Co.'s interests.

The Pilling Air Engine Co., Detroit, Mich., has succeeded to the business of the Pilling Air Engine Works of Bucyrus. Mr. J. L. Pilling is vice-president and general manager of the company.

The New York Safety Steam Power Co. has moved its offices to the Engineering Building, 114 Liberty St., New York. It will also maintain an erecting and repair department storeroom in the city.

The Lynchburg Foundry Co., of which Mr. Henry E. McWane is president and general manager, becomes the owner of the Radford Pipe Works, of Radford, Va. The acquisition of this plant will give the Lynchburg Foundry Co. an annual output of nearly 50,000 tons of cast-iron pipe. The original plant is now being operated under lease by the Glamorgan Pipe & Foundry Co., of Lynchburg, Va., of which company Mr. McWane was for many years the official head.

The Wm. B. Scaife & Sons Co., Pittsburg, Pa., has designed and erected a 172x78-ft. mill building of steel frame construction and covered with corrugated iron, for the Broomall Iron & Steel Co., Belington, W. Va.

The Abendroth & Root Mfg. Co., makers of spiral pipe, water-tube boilers, etc., has moved into new offices at 410 Monadnock Block. Allan N. McIntyre, western manager.

Among the contracts recently awarded to Frank B. Gilbreth on the cost-plus-fixed-sum basis is one for a 76x361-ft. car barn at North Syracuse, N. Y. An interesting feature of this car barn is the fact that instead of the conventional iron roof, the architects, Gaggin & Gaggin, have decided to use a concrete roof, as being more safe in case of fire than the usual construction. Besides the car barn the contract calls for the building of a 38x103-ft. substation.

The Sanitary Engineering Co., 237 Broadway, New York, has bought the business of the Municipal Engineering Co., of Delaware. The company's specialties are the design and construction of refuse crematories and sewage purification plants.

Owing to its rapidly increasing business, the California Asphaltum Sales Agency has removed its offices to the Whitehall Bldg., 17 Battery Place, New York.

Among recent orders taken by the Allis-Chalmers Co. are the following: Two 250-kw. alternators, a 100-kw. motor-generator and two exciters, for the Cincinnati Gas & Electric Co.; three 400-kw. alternators, three 200-kw. rotary converters, a 50-kw. motor-generator, transformers, switchboard, etc., for the H. C. Frick Coke Co., Connellsville, Pa.; a 600-kw. alternator and smaller apparatus for the Tuolumne Electric Co., San Jose, Cal.; a 32 and 68x60-in. heavy-duty cross-compound condensing engine for the Cleveland Electric Ry.; a 24 and 42x42-in. heavy-duty Reynolds-Corliss engine for the U. S. Coal & Coke Co., Gary, W. Va.; a 44 and 84x60-in. blowing engine for the Shenango Furnace Co., Sharpsville, Pa.; a 22x42-in. heavy-duty non-condensing engine for the Harbinson & Walker Refractories Co., Pittsburg; a complete 222-kw. unit for the municipal lighting plant at Hastings, Neb.; a 46 and 88x60-in. blowing engine, with 76-in. tubs, for the Republic Iron & Steel Co.; two Bullock railway generators for the Walkill Transit Co., at Middletown, N. Y.; a 22 and 40x42-in. horizontal cross-compound engine for the Wilkes-Barre Gas & Electric Co.; four heavy-duty cross-compound Reynolds-Corliss engines and six generators for the new Sears-Roebuck Building in Chicago.

The Trump Mfg. Co., Springfield, O., reports the following among recent contracts for Trump turbines for an electrical concern in Illinois, six of the largest vertical type turbines, this being a duplicate contract of one placed some time ago; a paper mill in Massachusetts, five of the largest size horizontal type turbines; an electric railway in Central New York, a pair of the company's largest size horizontal wheels in steel case. The above orders, together with a large number on which the company is already at work, have the plant running to its full capacity.

Dodge & Day, engineers and architects, Philadelphia, Pa., have been commissioned by the Electro-Dynamic Co. to make an examination of the existing methods in their shops at Bayonne, N. J., and submit report thereon as a basis for improvements. Business of the Dynamic Company has increased to such an extent that it has become an urgent necessity of speeding up the shop, or else providing more adequate facilities, or both. Some years ago the Link-Belt Engineering Co. were running their shops night and day, yet were unable to keep up with their orders. Extensive additions were contemplated to their buildings, but before carrying out their idea they called in Dodge & Day. As a result 25 per cent. greater business is being done to-day on the same floor area, and night work entirely suspended.

The Missisquoi Pulp Co., Sheldon Springs, Vt., have contracted with the Aberthaw Construction Co., Boston, to build a concrete-steel dam across the Missisquoi River. The dam will be about 300 ft. between abutments and from 15 to 38 ft. high. The engineers of the dam are the Ambursen Hydraulic Construction Co., 176 Federal Street, Boston, Mass., and the design is such to warrant the dam against the heavy ice gorges which in the past have carried out several crib dams at that point.

The Navy Department has placed an order with the Ingersoll-Sergeant Drill Co. for a Class "G C" air compressor to be located at the Portsmouth, N. H., Navy Yard. The compressor has compound steam cylinders 19 and 35 in. in diamter, compound air cylinders 32¼ and 20¼ in. in diameter and 24-in. stroke. Its capacity is 2,179 cu. ft. of free air per minute.

The Chicago office of the Reeves Engine Co. has been moved to 805 Ellsworth Bldg., 355 Dearborn Street.

The Murphy automatic smokeless furnace is described in a handsome catalogue issued by the Murphy Iron Works, Detroit, Mich. The details of the inclined grate construction, together with the special type of coal feed and hot air blast, are well shown. Views are also presented of several representative installations under different makes of boilers.

PERSONAL NOTES.

Mr. G. H. Kimball, assistant city engineer of Little Rock, Ark., has resigned.

Mr. Irving H. Reynolds has been elected vice-president and general manager of The William Tod Co., of Youngstown, Ohio.

Mr. Leroy F. Harza, engineering aid in the U. S. Reclamation Service, has been assigned to duty under Mr. C. S. Slichter, at Madison, Wis.

Mr. A. W. Walker, engineering aid in the U. S. Reclamation Service, has been assigned to duty under Mr. Raymond F. Walter at Belle Fourche, S. D.

Mr. Thomas Halsey, formerly assistant chief engineer of the Copper Range R. R., has been appointed chief engineer of the Des Moines & Southwestern Ry.

Mr. Edward L. Edes has been appointed engineering aid in the U. S. Reclamation Service and requested to report to Mr. G. L. Swendsen at Salt Lake City, Utah.

Mr. Robert McF. Doble, consulting engineer of the Abner Doble Co., San Francisco, Cal., is in Mexico, investigating several important hydro-electric long-distance power projects.

Mr. George E. Goodwin, of the Boston office of the U. S. Engineer Corps, has been transferred to the Interior Department and will probably be engaged in the Reclamation Service.

Messrs. Adolph H. Rossing and Lothrop Crosby have been appointed engineering aids in the U. S. Reclamation Service and ordered to report to Mr. J. E. Field at Ft. Laramie, Wyo.

Mr. Thomas F. Cushing has opened an office in the Fuller Building, New York City, under the firm name of the Thomas F. Cushing Co., and will handle steam, gas and water engineering supplies.

Mr. Henry A. Young has been transferred from the office of the U. S. Engineer at Ft. Washington, Md., to the U. S. Reclamation Service and will report to Mr. H. N. Savage at Billings, Mont.

Mr. Walter B. Harrington, field assistant to Mr. L. H. Taylor, supervising engineer of the Truckee High Line irrigation canal near Wadsworth, Nev., has been appointed engineering aid in the U. S. Reclamation Service.

Messrs. Frederick L. Humphrey and Frederick A. Biggi, of New York City, have received appointments as engineering aids in the U. S. Reclamation Service, and will be engaged for the present in the Washington office of the Reclamation service.

Mr. George R. Kempton has been transferred from the U. S. Treasury Department to the U. S. Reclamation Service, and will be engaged as electrical engineer under Mr. H. A. Storrs, at Denver, Colo.

Mr. George H. Clark, a pioneer engineer on the Genesee, N. Y., Valley canal and the New York Central & Hudson River Ry., and prior to 1858 superintendent of the Albany & Northern Ry., died at his home in Brooklyn, N. Y., June 3.

The affection with which the late H. Mueller was regarded by the employes of the H. Mueller Mfg. Co., of Decatur, was well shown on Decoration Day, when about 300 of them marched to the local cemetery and placed flowers on his grave.

Mr. Norman McD. Crawford has resigned the office of general manager of the Hartford Street Railway Co. to become consulting engineer of the Consolidated Railway Co. He will be succeeded by Mr. Frank Canns, formerly superintendent of the company.

Mr. Walter J. Thomas has been appointed master mechanic of the Panama R. R., with headquarters at Colon. Mr. Thomas entered railroad service about 1880 and has been almost continually in the mechanical departments of various Western railroads since then.

Robert Cartwright, one of the best known engineers in Central New York, died on June 4. He had a very varied experience in the construction and management of water and gas works, hydraulic power plants and other undertakings. He practically retired from engineering work some years ago.

Mr. John F. Stevens, whose resignation as second vice-president of the Chicago, Rock Island & Pacific Ry. in charge of operation, was recently noted in this journal, has been appointed railway expert of the Philippine railway commission and will have entire charge of railway construction work on the islands.

Major T. H. Handbury and Captain W. W. Harris, both of the Engineer Corps, U. S. A., have been appointed by the Secretary of War to act with Lieut.-Colonel W. H. Heuer in making an examination of the Sacramento, Feather and San Joaquin Rivers, with a view to their improvement for navigation.

Mr. William T. Lees, chief engineer of the Twenty-First St. branch of the Consolidated Gas Co., of New York City, died at his home in Brooklyn, N. Y., June 2. Mr. Lees graduated from the School of Mines of Columbia University and afterward did post-graduate work in chemistry in Heidelberg University.

Mr. F. N. Gerwig, master mechanic of the Duquesne blast furnaces, has resigned to become assistant superintendent of the Carrie furnaces of the Carnegie Steel Co., at Rankin, Pa. Mr. Harry W. Mohr has been appointed manager of the Carrie blast furnaces to succeed Mr. George H. Hampfiedt, who has resigned. Mr. James Lamont has been appointed assistant master mechanic of the Donora works of that company.

Mr. J. R. Onderdonk, engineer of tests in the motive power department of the Baltimore & Ohio Ry., has been appointed engineer of tests in charge of the testing bureau which that road has recently established at Baltimore. He will have charge of the tests and inspection of the large amount of rolling stock which his company has recently purchased. Mr. Onderdonk graduated from Stevens Institute in 1889 and entered the service of the Baltimore & Ohio in 1890.

Col. E. A. Stevens, of Hoboken, N. J., has become a partner in the firm of Cox & Stevens, naval architects, successors to Gardner & Cox, of New York City. The firm will carry on a general practice of naval architecture and engineering in addition to its yacht and vessel brokerage business. Col. Stevens has a wide reputation as a designer of ferry boats, the four new double-deck boats which the Delaware, Lackawanna & Western R. R. recently put in commission on the North River, between New York City and Hoboken, being his most recent achievement.

The late Frederick J. Warren, of Boston, was one of the most energetic and promising business men of his age in the country. As the organizer of the Warren Bros. Co., he was known in all the larger cities of the country where bitulithic pavements have been considered, and the development of this company in about five years was largely due to his unusual ability and energy. A brief memorial of his career, issued by the company, gives an interesting summary of the leading incidents in his career.

Mr. W. A. Blanck has opened an office for consulting electrical engineering practice in the Fisher Bldg., Chicago. Mr. Blanck was born and educated in Germany and began his engineering experience with Siemens & Halske. He was afterward engineer of high-tension lighting and power work for the Ganz Co., of Budapest for six years. Since coming to this country he has been connected with the Chicago Edison Co., the Arnold Co., and the Chicago & Milwaukee Electric Ry. He has been electrical engineer of the later road in charge of electrical operation and construction during the past year, and will continue as consulting engineer to the company.

Gov. Frank W. Higgins, of New York, has announced his appointments to the following commissions of that State: State Water Commission, Mr. H. H. Persons, of East Aurora, president; Dr. Ernst J. Lederle, ex-commissioner of health of New York City; Mr. John A. Sleicher, of New York; Mr. Milo M. Acker, of Hornellsville, and Mr. Charles Davis, of Kingston. State Gas Commission, Messrs. James R. Sheffield, of New York; Lucien L. Shedden, of Plattsburg, and John C. Davies, of Camden; Mr. George W. Aldridge, formerly superintendent of public works of the State of New York, has been appointed as an additional member of the Statte Railroad Commission.

Mr. J. B. Dickson has been appointed chief engineer of maintenance of way of the Baltimore & Ohio Ry., with headquarters at Baltimore, Md. Mr. H. L. Hale, engineer of maintenance of way of the Baltimore division, becomes engineer of maintenance of way of the main line section, with headquarters at Baltimore, and will be succeeded in his present position by Mr. V. K. Hendricks. Mr. H. H. Temple, division engineer at Pittsburg, has been appointed engineer of maintenance of way of the Pittsburg section, with headquarters at Pittsburg, and will be succeeded as division engineer by Mr. L. R. Rossiter. Mr. J. A. Spielman, superintendent of the Chicago division, has been made engineer of maintenance of way of the Wheeling section, with headquarters at Wheeling, W. Va.

The following candidates for admission to the American Society of Civil Engineers were announced elected at the regular meeting, June 7. As members: Lansing H. Beach, Major, Engineer Corps, U. S. A., Detroit, Mich.; Daniel W. Cole, Constr. Engr., U. S. Geological Survey, Reclamation Service, Cody, Wyo.; Webster Gazlay, vice-pres. and engr., National Concrete Construction Co., Louisville, Ky.; Edgar A. Harper, city engineer, Kansas City, Mo.; John R. Savage, chief engineer, Long Island R. R., Jamaica, N. Y.; George L. Swendsen, district engr., U. S. Reclamation Service, Salt Lake City, Utah; Arthur M. Waitt, consulting engr., New York City. As associate members: Ralph N. Begien, asst. engr., Baltimore & Ohio Ry., Morgantown, W. Va.; Alphonsos H. Bieler, gen. supt. of constr. for Boring & Tilton, archts., New York City; John W. Darling, resident engr., N. Y., P. & S. W. Ry., Binghamton, N. Y.; Weston E. Fuller, resident engineer for Hazen & Whipple at Poughkeepsie, N. Y.; John B. Gordon, asst. engineer, sewer div., engr. dept., District of Columbia, Washington, D. C.; Henry A. Harris, resident engr., Atlantic & Birmingham Ry., Oglethorpe, Ga. Edwin C. Hayden, with Chas. A. Haskin, contractor, Boston, Mass.; Clark N. Kast, asst. div. engr., Arkansas division, C. R. I. & P. R. R., Little Rock, Ark.; Louis E. Lannan, draftsman in charge of office, R. F. & P. Ry. and Washington Southern Ry., at Richmond, Va.; Edward R. Mack, water dept., Wilmington, Del.; James G. Melluish, Bloomington, Ill.; Charles H. Paul, engr., U. S. Reclamation Service, Glendive, Mont.; Herbert A. Rice, instructor in civil engineering, Lehigh Univ., South Bethlehem, Pa.; Chas. S. Sheldon, asst. engineer in charge of bridge work, C., H. & D. R. R., Cincinnati, O.; John H. Shortt, with the Consolidated Gas Co., New York City; Wm. T. Sitt, cons. engr. for Wells Bros. Co., New York City; Albert H. Sylvester, topographer U. S. Geological Survey, Sacramento, Cal.; Edwin A. Taylor, with Wm. H. Tylee, contractor, Worcester, Mass.; Wm. E. Wilson, asst. prof. of civil engr., State School of Mines, Univ. of Utah, mining engineer Century Gold Mining & Milling Co., member of firm Lyman E. Wilson, Salt Lake City, Utah; Bruce C. Yates, first asst. engr., Homestake Mining Co., Lead, S. Dak. Samuel M. Young, with A. B. Sanders, contr. engr., Magnolia, Miss.. As associates: John A. Ubsdel, St. Louis, Mo.. The following candidates were announced transferred from the grade of associate member to member: Theodore Horton, York, Pa.; Benjamin B. Lathbury, Philadelphia, Pa.; Elmer J. McCaustland, Ithaca, N. Y.; Thomas F. McGilvray, Duluth, Minn.; James C. Nagle, College Station, Tex.; Harry N. Pharr, Memphis, Tenn.; Charles M. Spofford, Boston, Mass.; Alexander M. Todd, Vicksburg, Miss.; Joel E. Wadsworth, New York City; Charles W. S. Wilson, New York City. The following candidates were announced elected juniors: Charles W. H. Barker, Aspinwall, Pa.; Robert H. Brown, New York City; Julius R. Hall, Elmira, N. Y.; Horace P. Hamlin, Orono, Me.; Edward Hitchins, Millinocker, Me.; Marvin Shrebler, New York City.

Mr. Geo. Gibbs on June 1 resigned as vice-president of Westinghouse, Church, Kerr & Co. and as consulting engineer of the Interborough Rapid Transit Co., of New York, to become chief engineer of electric traction of the terminal operation of the Pennsylvania Railroad in New York, and chief engineer of electric traction of the Long Island R. R. In these positions Mr. Gibbs will have charge of all the electrical engineering and the design and execution of work in connection with the Pennsylvania R. R.'s tunnels, yards, terminals, power houses, etc., as well as the design and installation of all electric traction work which the Long Island R. R. has in contemplation. The work of which he will have charge constitutes the largest electric traction project on any steam railroad in the world. In addition to it, Mr. Gibbs has accepted the position of consulting engineer of the Metropolitan Street Ry. Co., of New York, for its proposed subway work. Mr. Gibbs is best known through his work in connection with the present subway lines in New York, in which he took a very prominent part as engineer in charge of the rolling stock and block signal system, and to him more than to any one else is due the credit of installing the steel cars in the subway. These cars were the first steel passenger cars in the world and were largely of Mr. Gibbs's design. Another of his notable achievements was that of applying in the subway, and for the first time in this country, the overlapping block-signal system. Mr. Gibbs was graduated from the Stevens Institute of Technology in 1882 with the degree of mechanical engineer. From 1882 to 1884 he was engaged as chemist for the Orford Copper Co., and from the latter date to 1888 was engineer of tests and chemist of the Chicago, Milwaukee & St. Paul Ry., at Milwaukee, Wis. From 1888 to 1897 he was mechanical engineer of that road. In this position he had charge of all car and locomotive design, as well as of interlocking and track signals. From 1897 to 1902 he was consulting engineer of the Baldwin Locomotive Works and of the Westinghouse Electric & Mfg. Co., also chief engineer of the British Westinghouse Electric & Mfg. Co., Ltd., and of the Continental Westinghouse companies. Since 1901 Mr. Gibbs has been first vice-president of Westinghouse, Church, Kerr & Co., of New York; consulting engineer of the Interborough Rapid Transit Co., of New York; member of the board of engineers of the Pennsylvania R. R. Co.'s New York tunnel lines and terminals; member of the Electric Traction Commission of the New York Central & Hudson River R. R. Co.'s New York terminal and electric traction lines, and electrical engineer of the Long Island R. R. Co.'s lines, which are being converted to electricity. In the positions enumerated he had charge of the following work: For the Interborough Co., design of rolling stock, track work, interlocking and signals, shop yards and repair plants, and, in consultation, other railway facilities of the company; for the Pennsylvania R. R. in his capacity as member of the company's board of engineers to carry on this work, special charge of the company's electrical power plants, electric locomotives, power distribution system, and mechanical engineering features of the terminal yards and buildings; for the New York Central R. R., its electric traction work, including the equipment of its heavy electric locomotives, power plants and distributing system. Mr. Gibbs has also acted as confidential adviser in engineering of the Carnegie Institute, Washington, D. C. He is a member of the American Society of Civil Engineers, British Institution of Civil Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Railway Master Mechanics' Association and the Master Car Builders' Association.

CONTRACTING NEWS

OF SPECIAL INTEREST TO
CONTRACTORS, BUILDERS, ENGINEERS AND MANUFACTURERS
OF ENGINEERING AND BUILDING SUPPLIES.

WATER.

Notes Arranged Alphabetically by States.

Warren, Ark.—See "Power Plants, Gas and Electricity."

Rogers, Ark.—See "Power Plants, Gas and Electricity."

Ventura, Cal.—See "Power Plants, Gas and Electricity."

Santa Rosa, Cal.—City Clk. C. D. Clawson has been authorized to secure bids for a pump having a capacity of 2,500,000 gal. in 24 hours, to be operated either by steam or electricity.

San Francisco, Cal.—The Bd. of Superv. has adopted a resolution authorizing City Engr. Woodward and Engineers Marsden Manson and Luther Wagoner to investigate 3 propositions to sell to the city a water supply. The propositions include the Giant Cap project, the south fork of the American River project and the Mokelumne project. Any one of these involves an estimated expenditure of from $30,000,000 to $35,000,000.

Morgan Hill, Cal.—The Morgan Hill Water Co. has been incorporated to furnish water for domestic use and irrigation purposes; capital, $15,000. Dirs.: W. M. Mack, W. S. Fay and Finlay Yant, of Morgan Hill.

Danbury, Conn.—A. L. Davis, City Engr., writes that it is proposed to construct a reservoir at Boggs Pond, but the city has not yet completed settlements with land owners and mill rights; probable cost of construction, $125,000.

Wilmington, Del.—The following are the bids opened June 5 for a pumping engine of 12,000,000 gal. capacity: Holly Mfg. Co., Buffalo, N. Y., $79,769; Wm. Tod Co., Youngstown, O., $73,000; Allis-Chalmers Co., Milwaukee, Wis., $97,000; R. D. Wood & Co., Philadelphia, Pa., $79,000.

Arcadia, Fla.—It is stated that bids will be received until June 15 by the City Clk. for $13,000 water works, $12,000 school and $5,000 street improvement bonds.

Ft. De Soto, Fla.—Bids will be received until June 13 by R. S. Pratt, Constr. Q.-M., U. S. A., for furnishing material and sinking an 8-in. tubular well at this post.

Perry, Fla.—John C. Calhoun, City Clk., writes that it is proposed to construct water works. Engineer not yet selected.

Dawson, Ga.—J. B. McCrary, of Senoia, has been selected to prepare plans for water works and a sewerage system to cost $60,000 or $70,000. Surveys will commence at once, and when estimates are completed a bond election will be held.

**Delphi, Ind.*—John C. O'Connor is reported to have secured the contract for extending the water works (bids opened May 27) for $4,345.

Muncie, Ind.—The American Water Works Co. (Jas. H. Purdy, Pres., Pittsburg, Pa.), which controls the water works at Muncie, is reported to be considering the installation of a $50,000 pumping station.

Ringsted, Ia.—The citizens are reported to have voted to construct water works.

Chetopa, Kan.—See "Power Plants, Gas and Electricity."

Hammond, La.—J. B. Adams, Town Clk., writes that it is proposed to construct water works, at a cost of $20,000. Engineer, C. H. Jenks, Fayette, Miss.

Abbeville, La.—See "Power Plants, Gas and Electricity."

Ft. Levett, Me.—Bids will be received until June 17 by Capt. A. W. Yates, Q. M., U. S. A., Portland, for installing water, sewerage and drainage systems and sinking deep well at Ft. Levett.

Great Barrington, Mass.—E. A. Ellsworth, of Holyoke, in his report on the improvement of the water supply, recommends the East Mountain system and watershed, the work to include new reservoir, to cost $46,040; intake reservoir, $3,197; repairing Berkshire Heights reservoir, $5,255, and new supply mains, $12,050.

Rowe, Mass.—Gilbert Maxwell, of North Adams, writes that the Foliated Talc Co. is to construct a reservoir at Rowe, to cost about $1,500.

Republic, Mich.—See "Power Plants, Gas and Electricity."

Manistique, Mich.—Bids are wanted June 22 for furnishing material and constructing water works, as advertised in The Engineering Record.

Wheaton, Minn.—It is stated that bids will be received until June 19 by the Village Council for water works improvements, including furnishing c. i. pipe, specials, hydrants, valves and valve boxes, laying of same and constructing a brick pump house. Loweth & Wolffe, Engrs., First Natl. Bank Bldg., St. Paul.

**Harmony, Minn.*—H. C. Horsend, Village Recorder, writes that the contract for furnishing material and laying c. i. pipe and specials (bids opened June 2) has been awarded to A. L. Bennett, of Preston.

Brandon, Minn.—J. C. Metcalf, Village Recorder, writes that it is proposed to construct water works, at a cost of $6,000. No engineer selected as yet. Bids will probably be called for next fall or winter.

Duluth, Minn.—The Water & Light Comrs. (L. N. Case, Mgr.) have purchased property in Lloyds addition for the proposed reservoir to be constructed by the city at a cost of $40,000.

Lamberton, Minn.—It is reported that bids will be received until June 19 by Geo. J. Grimm, Village Recorder, for improving the water system according to plans by J. F. Johnson, of Gibbon.

**Items marked thus give the names of parties awarded contracts.*

New York, N. Y.—The following are the bids opened on May 31 by the Aqueduct Comrs., for constructing a reservoir, including the building of a masonry dam across Cross River, east of Katonah station; (*a*) Coleman, Bouchard & Coleman, Croton; (*b*) Ryan & Parker Constr. Co., 21 Park Row; (*c*) Bart Dunn, 448 E. 68th St.; (*d*) W. J. Flanagan, Yonkers; (*e*) Naughton & Co., 258 Bway.; (*f*) Constr. Co. of America, 38 Park Row; (*g*) McArthur Bros. Co. & Winston Co., N. Y. City and Clinton, Mass.:

	a	*b*	*c*	*d*	*e*	*f*	*g*
65,000 cu. yds. earth excav., Class A	$.80	$.30	$.46	$1.00	$.62	$.55	$.80
3,000 cu. yds. earth excav., Class B	1.25	1.50	1.56	1.00	1.02	.75	1.50
120,000 cu. yds. earth excav., Class C	.50	.25	.35	.28	.31	.25	.45
25,000 cu. yds. rock excav., Class A	1.50	1.50	1.62	2.00	1.50	2.00	1.75
5,000 cu. yds. rock excav., Class B	4.00	3.50	5.00	2.00	3.12	5.00	5.00
25,000 cu. yds. rock excav., Class C	1.75	1.50	1.00	1.50	1.50	1.75	1.75
4,000 cu. yds. rock excav., Class D	1.75	1.50	1.50	1.50	1.02	.75	1.75
4,000 cu. yds. refill. and embank., Class A	.45	.30	.35	.50	.31	.75	.40
32,000 cu. yds. refill. and embank., Class B	.35	.15	.30	.30	.25	.30	.20
Overhaul, equivalent to 1,000 cu. yds. hauled 100 ft.	.02	.02	.01	.05	.01	.02	.02
1,500 M. ft. timber and lumber	35.00	35.00	20.00	1.00	41.00	35.00	.01
5,000 lin. ft. round piles	.25	.15	.37	.20	.31	40.00	.01
River controlling works	10000.00	39000.00	5013.00	10000.00	12500.00	40000.00	30000.00
160 tons steel derrick towers in dam	60.00	70.00	92.50	1.00	100.00	150.00	.01
135,000 bbls. Portland cement	1.50	1.75	1.70	1.70	1.90	1.50	1.30
17,500 cu. yds. concrete blocks	9.00	7.50	7.25	7.50	6.25	5.50	12.00
6,000 sq. yds. monolithic concrete masonry	5.50	5.50	6.13	6.00	5.00	5.00	6.50
2,000 sq. yds. granolithic finish	.50	1.15	.34	1.50	.62	.60	.60
1,000 bbls. grout of Portland cement	2.00	2.00	3.00	2.00	.75	3.00	1.00
32,000 cu. yds. cyclopean masonry	3.50	2.90	2.40	3.00	2.20	3.00	2.90
100 cu. yds. rubble stone masonry	3.50	3.25	3.00	5.00	5.00	5.00	5.50
10 cu. yds. dimension stone masonry	50.00	35.00	50.00	100.00	43.75	22.00	75.00
10,000 sq. ft. face dressing of concrete	.20	.15	.12	.20	.12	.20	.10
200 sq. ft. face dressing of stone	1.00	.50	.62	1.00	.62	.50	.75
4,000 cu. yds. dry rubble paving	3.00	2.75	2.00	3.00	3.75	2.50	3.00
500 cu. yds. rip-rap	2.00	1.50	1.25	1.50	2.18	1.50	1.50
25 tons steel pipes and specials	80.00	100.00	80.00	120.00	100.00	100.00	160.00
Valves and sluice gates (lump sum)	5000.00	3750.00	5312.00	6000.00	5225.00	5000.00	5000.00
45 tons cast-iron pipes	50.00	40.00	37.50	50.00	46.25	60.00	50.00
25 tons special pipe castings	90.00	60.00	50.00	100.00	78.75	110.00	100.00
40,000 lbs. miscellaneous iron castings	.03½	.03	.05	.05	.05	.07	.07
7,000 lbs. miscellaneous brass or bronze castings	.30	.24	.30	.30	.37	.50	.50
15,000 lbs. steel and wrought iron work, Class A	.05	.05	.05	.06	.12	.08	.09
60,000 lbs. steel and wrought iron work, Class B	.04	.03	.04	.06	.03	.05	.07
1,750 lin. ft. railings for top of dam	1.00	2.50	2.75	2.50	2.50	.60	2.80
400 lin. ft. railing for various places	1.00	.75	2.75	2.50	1.00	1.50	.70
2,000 lbs. caring for and setting metal work furnished by city	.04	.05	.04	.04	.12	.15	.03
8,000 lin. ft. State highways, surfacing and miscellaneous work	.50	1.40	.44	1.00	1.50	1.60	1.40
20,000 lin. ft. county highways, surfacing and miscellaneous work	.25	.60	.84	.20	.80	1.20	.25
7,000 sq. yds. private roads and paths	.20	.60	.42	.15	.62	.75	.25
600 lin. ft. furnishing and laying vitr. pipes, 12 in. or less	1.00	2.00	.80	1.00	1.25	.25	.60
300 lin. ft. furnishing and laying vitr. pipes, 15 or 18 in	1.50	2.00	2.00	1.25	1.87	.40	1.25
47,000 lin. ft. fence and guard rail	.40	.20	.20	.25	.31	.20	.25
90,000 lin. ft. stone boundary walls	.90	.50	.56	.60	.65	.50	.80
870 acres clearing the reservoir	20.00	25.00	1.00	30.00	25.00	25.00	10.00
34,000 sq. yds. grassing	.12	.30	.12	.03	.06	.30	.05
Flashboards, stop planks and wooden gratings (lump sum)	750.00	450.00	250.00	2000.00	625.00	250.00	1000.00
500 cu. yds. crushed stone and screened gravel for miscellaneous uses	1.50	1.50	2.70	2.00	.62	.80	1.50
Superstructure of gatehouse	5000.00	7500.00	6000.00	6000.00	6875.00	4500.00	8000.00
Total	$1,344.030	$1,207,750	$1,080,319	$1,187,260	$1,145,957	$1,222,610	$1,246,212

Starkville, Miss.—See "Power Plants, Gas and Electricity."

Liberty, Mo.—Bids are wanted June 22 for constructing water works, as advertised in The Engineering Record.

**Ft. Benton, Mont.*—A. E. Lewis is stated to have secured the contract for constructing new storage reservoir for $4,278.

Merna, Neb.—R. J. Kelly, Chmn. Bd. Trus., writes that it is proposed to construct water works, at a cost of $6,000 to $7,000.

Camden, N. J.—It is stated that bids will be received unti June 13 by Jos. Potter, Chmn. Water Com., for furnishing the following supplies for the ensuing year: c. i., pipe and special castings; fire hydrants, water valves, extension valve boxes, sleeves and valves for Smith tapping machine, corporation stop, 10,000 lbs. lead and water meters from ⅝ to 10 in. in diameter.

Highlands, N. J.—See "Power Plants, Gas and Electricity."

Ft. Mott, N. J.—Bids will be received June 15 by Capt. L. F. Garrard, Jr., Q. M., U. S. A., Delaware City, Del., for a distilling plant and reservoir at Ft. Mott, as advertised in The Engineering Record.

New York, N. Y.—The Governor has signed the following water supply bills: Mr. Tompkins's bill authorizing the Mayor of N. Y. City to appoint a commission of 3, to be known as the Bd. of Water Supply of the City of New York, to provide for an additional supply of water for the city; Mr. Apgar's bill relative to the procedure to be followed by New York City in acquiring property for a water supply and requiring appraisal commissions to make awards within a year, and Mr. Yale's bill to prevent water rights in Putnam County being taken for New York's water supply purposes.

Albany, N. Y.—The Governor has signed Mr. Agnew's bill creating a State water supply comn. of 5 members appointed by the Governor to supervise the acquiring of new sources of water supply by municipalities and appropriating $40,000 for carrying out the purposes of the act.

Albany, N. Y.—Wallace Greenalch, Supt. Bureau of Water, writes that about $400,000 will be expended for water works improvements. Plans and specifications will be completed in 2 or 3 months.

Ft. Michie, N. Y.—Bids will be received until June 15 by the Constr. Q.-M., U. S. A., New London, Conn., for constructing a water system at Ft. Michie.

Ft. Terry, N. Y.—Bids will be received June 15 by the Constr. Q.-M., U. S. A., New London, Conn., for constructing a distilling plant at Ft. Terry.

Lake Placid, N. Y.—See "Power Plants, Gas and Electricity."

Watertown, N. Y.—Water bonds amounting to $81,000 have been sold.

Shelby, N. C.—J. F. Leddy, Clk. Town Council, writes that there is some talk of constructing water works and a sewerage system, but nothing definite has yet been done.

Dickinson, N. D.—It is reported that plans are being prepared for water works.

Kenmare, N. D.—The construction of water works is reported under discussion here.

Plymouth, O.—See "Power Plants, Gas and Electricity."

Bellaire, O.—It is stated that the Bd. of Pub. Service will soon let contract for a filtration system in connection with the water works, to cost $35,000.

Newark, O.—The Lewis K. Davis Eng. Co., of Pittsburg, Pa., has been selected to revise plans and supervise the construction of municipal water works.

Oklahoma, Okla. Ter.—The City Council is reported to have under consideration, plans for the construction of water works, at a probable cost of $200,000.

Kingfisher, Okla. Ter.—It is stated that bids will be received until June 15 by Geo. P. Bonnett, City Clk., for $35,000 water works bonds.

Ft. Sill, Okla. Ter.—Bids will be received until June 14 by Robt. R. Stevens, Ch. Q.-M., U. S. A., San Antonio, Tex., for constructing and erecting a 100,000-gal. steel water tank and trestle at Ft. Sill.

Cottage Grove, Ore.—J. E. Young, City Recorder, writes that bids will be received about July 1 for the construction of water works, to cost about $15,000.

Dillon, S. C.—See "Power Plants, Gas and Electricity."

Cookeville, Tenn.—See "Power Plants, Gas and Electricity."

Nashville, Tenn.—The lowest bid opened May 25 by the Bd. of Pub. Wks. for furnishing boilers is stated to have been submitted by the Babcock & Wilcox Co., New York, N. Y.; it offered to furnish one boiler for $5,242 and two boilers for $9,700.

Ft. Sam Houston, Tex.—Bids will be received until June 14 by L. J. Fleming, Constr. Q.-M., U. S. A., for constructing a sewer and water distributing system at this place.

Dallas, Tex.—See "Power Plants, Gas and Electricity."

Monroe, Utah.—Wm. A. Warnock, City Clk., writes that the question of constructing water works is being investigated.

Norfolk, Va.—Bids will be receiveed by the Jamestown Exposition Co. June 24 for a surface and ground water drainage for sewers and for a water suppy on its property at Sewell's Point, as advertised in The Engineering Record.

**Salem, Va.*—The Virginia Bridge & Iron Co., of Roanoke, is stated to have secured the contract for the erection of a water tank at Salem for $8,191.

Richford, Vt.—F. H. Dewart, of St. Albans, is preparing plans for a storage reservoir, to cost from $3,000 to $5,000. Will likely be constructed by day's work. J. C. Baker, Chmn. Bd. Water Comrs.

Bristol, Vt.—The following are the bids opened June 2 for the construction of a gravity system of water works (Engineers, Lloyd & Mann, Concord, N. H.): Booth & Co., 42 Court. St., Boston. Mass., $73.405; Goodwin Constr. Co., 60 Wall St., New York, N. Y., $71,245; Miller-Collins Co., 1133 Bway, New York, N. Y., $61,499; Lucian A. Taylor, 719 Tremont Bldg., Boston, Mass., $58,531; The Loring N. Farnum Co., Boston, Mass., $58,449; Wm. S. Teachout, Essex Junction, Vt., $54,834; Crosby & Parker, Brattleboro, Vt., and Fitchburg, Mass., $54,811; Fred T. Ley & Co., Springfield, Mass., $54,400; Flood & Sherrill, Sandy Hill, N. Y., $53,945, and Denniston & Co., Ellnanger & Barry Bldg., Rochester, N. Y., $51,172.

Puyallup, Wash.—This city is reported to have decided to purchase the present water works and will construct a gravity system from Salmon Springs.

West Allis, Wis.—Water bonds to the amount of $60,000 and $15,000 sewer bonds were sold on May 31.

Ft John, N. B.—Bids will be received until June 28 by Fred Sandall, City Chamberlain, for $500,000 bonds; $378,500 for water extension to Loch Lomond, including the purchase of properties and rights and the payment for damages, etc.; also $9,500 for water and sewerage extensions (St. John City).

Winnipeg, Man.—The date of opening of bids for a supply of water pipe and specials for high-pressure fire service has again been extended from June 19 to June 23, as advertised in The Engineering Record.

SEWERAGE AND SEWAGE DISPOSAL.

Notes Arranged Alphabetically by States.

San Francisco, Cal.—Sewer bonds to the amount of $724,800 and street pavement bonds to the amount of $243,000 have been sold. This money will be expended during coming fiscal year ending June 30, 1906. Thos. P. Woodward, City Eng.

The City Street Improv. Co. has secured the contract for constructing a pipe sewer in H St. bet. 7th and 20th Aves. for $7,528, and same contractor for the reinforced concrete sewer in Mission St. bet. Onondaga Ave. and Amazon St. for $11,563.

Washington, D. C.—Bids will be received June 13 by the Comrs., D. C. (Henry L. West, Chmn.) for constructing sewers in the Dist. of Columbia.

Dawson, Ga.—See "Water."

Ft. McPherson, Ga.—Bids will be received until June 15 by Capt. B. B. Buck, Constr. Q. M., U. S. A., for constructing at this post 1 manhole and approximately 230 ft. sewer main, using 6-in. c. i. standard water pipe under ground and approximately 130 ft. 6-in. wrought iron pipe on piers.

Chicago, Ill.—Wm. S. MacHarg, Consulting Engr., Dept. of Pub. Wks., writes that bids will be received June 20 for the construction of Sect. T of the intercepting sewer, to cost about $125,000.

The Drainage Canal Bd. is stated to have on May 31 determined upon the immediate purchase of right of way for Calumet and Evanston auxiliary channels, which, with their completion, will add an additional $15,000,000 to the cost of the great sewage canal.

Greensburg, Ind.—Bids are wanted June 27 for the construction of 18 miles of sanitary pipe sewer and sewage disposal plant, also 3 miles of storm pipe sewers, as advertised in The Engineering Record.

Marion, Ind.—The Council is reported to have decided to construct a sewer from 4th St. to Grant and E. Sts. and on to the river, to cost from $8,500 to $10,000.

Vinton, Ia.—It is stated that plans and specifications will be received until June 16 for the establishing of a sewer system. W. E. Klingaman, City Clk.

Abbeville, La.—See "Power Plants, Gas and Electricity."

Ft. Levett, Me.—See "Water."

Worcester, Mass.—Harrison P. Eddy, Supt. of Sewers, writes that it is proposed to construct additional filter beds at the purification works, to be done by day's work; probable cost, $30,000.

Lowell, Mass.—City Engr. Bowen is reported to have estimated the cost of a pumping station and sewer connection at Oaklands, at $12,700.

Grand Rapids, Mich.—L. W. Anderson, City Engr., writes that the West Side sewer will probably be or-

**Items marked thus give the names of parties awarded contracts.*

dered later in the summer. The material will probably be of concrete or concrete-steel.

Wyandotte, Mich.—The Bd. of Pub. Wks. is reported to have selected Mason L. Brown, 821 Chamber of Commerce Bldg., Detroit, to prepare plans and specifications and superintend the construction of a gravity system of sewers; probable cost, $70,000.

Houghton, Mich.—G. L. Clausen, Village Engr., writes that plans are being prepared for a sewerage system for West Houghton, but plans are not far enough advanced to give estimate of cost.

Manistique, Mich.—Bids are wanted June 22 for the construction of a sewerage system, as advertised in The Engineering Record.

Greenville, Mich.—The Riggs & Sherman Co., 613 "The Nasby," Toledo, O., will prepare plans and specifications for a complete sewerage system for Greenville, but only the trunk sewer will be constructed this year. Plans will not be ready until about July 15.

St. Paul, Minn.—The lowest bid opened May 29 for constructing sewers in Laurel and Snelling Aves. was submitted by John Lind, 277 Rondo St., for $4,500, the work to consist of 1,725 lin. ft. 15 and 9-in. vitr. pipe, 11 catch basins and 8 manholes.

Le Sueur, Minn.—Bids will be received until June 16 by the City Council for constructing 1,020 ft. sewer. Theo. G. Mahler, City Clk.

Brainerd, Minn.—Bids will be received until July 3 by the City Council for constructing a lateral sewer in Sewer Dist. No. 1, consisting of 966 ft. 8 and 6-in. pipe, 3 manholes, etc. F. E. Low, City Clk.

**Pipestone, Minn.*—R. F. Weston, of La Crosse, Wis., has secured the contract to construct a sewerage system and septic tank (bids opened May 29) for $11,303.

University Place, Neb.—It is stated that bids will be received until June 17 by T. M. Wimberly, City Clk., for constructing a system of sewerage.

Jersey City, N. J.—The Street and Water Bd. is stated to have decided to construct sewers in Sherman Pl. and in Nunda Ave.

Asbury Park, N. J.—The following are reported to be the bids opened by the City Council June 1 for rebuilding the sewer outlet at Oak Bluff Ave. and extending it 1,200 ft. to sea: Matthews Bros., Red Bank, $12,885, and S. L. Bartholomew, $15,000.

New York, N. Y.—Bids will be received June 20 by Louis F. Haffen, Pres. Boro. Bronx, for constructing sewers and appurtenances in portions of Vyse Ave. and Jefferson St. Engineer's estimate: 1,505 lin. ft. 12-in. pipe sewer; 1,605 cu. yd. rock to be excav.; 17 manholes, complete, etc., in Boro. Bronx.

**Brooklyn, N. Y.*—The Brooklyn Grade Crossing Commission is stated to have on June 6 awarded the contract for building a sewer in Newkirk Ave. and Avenue F, for draining a part of the depressed section of the Brighton Beach division, to Henry Montgomery, at $42,100.

East Syracuse, N. Y.—Bonds to the amount of $25,000 are reported sold, to be used to complete the sewerage system and construct a disposal plant.

Bids are wanted June 15 for constructing sewage disposal works and appurtenances, as advertised in The Engineering Record.

**Ballston Spa, N. Y.*—Irwin & Koester, of Greenville, O., are stated to have secured the contract for constructing about 8 miles of sewers (bids opened May 25) for $24,451.

Buffalo, N. Y.—The Aldermanic Fin. Com. has decided to report favorably on the issue of $150,000 bonds authorized by Legislature, for the completion of sewers in the district which includes the Main and Hamburg Canal, Ohio Basin Slip and Clark and Skinner Canal.

Utica, N. Y.—The N. Y. Central & Hudson River R. R. Co. is reported to have approved plans for the sewer outlet for the proposed trunk sewer, and contracts for its construction will probably soon be let. Paul Schultze, City Engr.

Buffalo, N. Y.—Bids will be received by the Dept. Pub. Wks. (Francis G. Ward, Comr.) until June 15 for constructing a 39, 33, 30, 27, 24-in. brick, 18, 15, 12 and 10-in. tile sewer in portions of 5 streets.

Bronxville, N. Y.—Bids are wanted June 16 for constructing several miles of sewers. Plans can be obtained from C. W. Leavitt, Jr., 15 Cortlandt St., N. Y. City, or Village Clk.

Shelby, N. C.—See "Water."

**Bismarck, N. D.*—Jas. Kennedy, of Fargo, has secured the contract for constructing a sanitary sewerage system (bids opened June 1) for $52,000. The work consists of 8,200 ft. 18-in. trunk sewer, 6,080 ft. 12-in., 4,180 ft. 10-in. and 9,660 ft. 8-in. lateral sewers, 61 manholes and 8 flush tanks. Saml. F. Crabbe, of Fargo, is Consulting Engr.

London, O.—It is stated that bids will be received until June 26 by John W. Byers, Village Clk., for constructing a sanitary sewer and disposal works.

Ravenna, O.—S. J. Post, City Clk., writes that bids are wanted June 24 for a sewerage system and sewage disposal plant; probable cost, $100,000. Engineer, W. E. Meyers, Kenton.

**Columbus, O.*—The Bd. of Pub. Service is stated to have on June 2 awarded to A. F. Helm, the contract for constructing the South Side sanitary sewer, for $12,270.

**Cincinnati, O.*—The Bd. of Pub. Service is stated to have awarded contracts for sewers as follows: To Thos. P. Strack at $24,555 for a sewer in the ravine south of Quebec Ave., and to J. E. Mahoney at $10,060 for a sewer in Bassett Road and a right of way to Mt. Hope Road.

Leetonia, O.—The State Bd. of Health has approved plans for sewerage and sewage purification plant for Leetonia. Engineers, Williams & Whitman, New York, N. Y.

Portland, Ore.—City Engr. Wanzer is reported to have completed plans for the construction of the Brooklyn Dist. sewer, which will cost about $200,000. Contracts will probably soon be let.

**Sharon Hill, Pa.*—Edwin H. Vare, of Philadelphia, is stated to have secured the contract for constructing a sewerage system (bids opened May 16) for $17,856.

**Erie, Pa.*—John McCormick & Son, 645 W. 10th St., are stated to have secured the contract for constructing the Wayne St. sewer system and laterals (bids opened June 1), the 24-in. portion to be built of concrete, at $16,239 for the entire work and 38 cts. per ft. for 6-in. house connections. The contract for the 18 and 12-in. sewer in Wallace and 7th Sts. (bids opened same date) is stated to have been awarded to Jos. McCormick at $1.30 for 18-in. pipe, $1.15 for 12-in., 60 cts. for 9-in., 35 cts. for 6-in., $1.50 for 18-in. branches, $1.30 for 12-in. branches and $38 for manholes.

Indiana, Pa.—Bids will be received until June 15 by the Boro. Council for 5,000 ft. of 6, 8 and 10-in. pipe sewers, with the necessary manholes, etc. Address R. M. Mullen, Boro. Engr.

Providence, R. I.—Bids will be received by the Comn. on State Sanatorium for Consumptives (C. Alvin Potter, Chmn., 49 Westminster St.) until June 14 for constructing a plant for the disposal of sewage from the buildings at the State Sanatorium at Burrillville. J. A. Latham, Engr., 87 Weybosset St., Providence.

Columbia, Tenn.—The City Council is reported to be considering the question of extending the sewerage system.

Ft. Sam Houston, Tex.—See "Water."

Roanoke, Va.—The question of expending $125,000 for improving the sewerage system is reported under consideration.

Norfolk, Va.—See "Water."

West Allis, Wis.—See "Water."

Janesville, Wis.—C. V. Kerch, City. Engr., writes that the bids to be received on June 22 by the Street Assessment Com. call for the construction of 1,673 ft. 8-in. sanitary sewer.

Toronto, Ont.—The Council is reported to have under consideration the question of installing a system of septic tanks and bacteria beds at foot of Woodbine Ave.; the cost of the system is estimated at $80,000.

St. John, N. B.—See "Water."

BRIDGES.

Notes Arranged Alphabetically by States.

Nevada City, Cal.—It is stated that bids will be received until June 16 by the Bd. Superv. (F. L. Arbogost, Clk.), for removing a Pratt truss bridge and approaches at Edwards Crossing and erecting main span of 101 ft. at Dry Creek bridge site.

**Pueblo, Colo.*—The Pueblo Bridge Co., of Pueblo, is stated to have received the contract for constructing 2 bridges, one over the Chico and one over the Huerfano, for about $11,000.

Denver, Colo.—The Bd. of Pub. Wks. is stated to have recommended awarding the contract for constructing the bridge over Platte River at W. Colfax St. to the Marsh Bridge Co. of Des Moines, Ia., for $23,500.

Moline, Ill.—It is reported that bids will be received until June 24 by the Bd. Co. Comrs. for constructing an iron bridge with concrete foundations near 7th St. Nathan Erickson, Co. Clk.

Chicago, Ill.—The following are the bids opened May 27 by the Dept. Pub. Wks. for constructing substructure and superstructure of temporary high bridge over Calumet River at Torrence Ave.: Jackson & Corbett, $18,403; Fitzsimmons & Connell, $18,850; Great Lakes Dredge & Development Co., $20,472; Thos. McDonough, $20,741, and John O'Brien, $27,420. The detail bid of Jackson & Corbett, the lowest bidder, is as follows: Lump sum for structure, $11,110; 15,000 lin. ft. piles delivered, 16 cts.; 14,000 lin. ft. piles driven, 9 cts. 50 M. ft. common pile timber, $34 28 M ft. yellow pine, $37.50; 32 M ft. white oak, $46, and bridge tender's house, $410.

Indianapolis, Ind.—Bridge bonds amounting to $50,000 are reported sold.

Indianapolis, Ind.—See "Railroads."

Warsaw, Ind.—It is reported that bids will be received until June 15 by the Bd. Co. Comrs. (Jacob O. Deaton, Chmn.) for constructing 13 steel bridges, 16 pairs of stone abutments, 16 arches and repairing 2 bridges.

Columbia City, Ind.—It is reported that bids will be received until June 20 by the Bd. Co. Comrs. for constructing several steel bridges and concrete and stone abutments throughout the county. Chas. E. Lancaster, Co. Aud.

**New Orleans, La.* — The contract for constructing a bridge over Town Creek at Rankin St. is stated to have been awarded to Sands, Lawson & Kon Co., of Norfolk, Va., for $5,,600.

Natchitoches, La.—It is stated that the Bd. of Police Jurors (P. E. Prudhomme, Pres.) will receive bids until July 3 for constructing an iron bridge in Natchitoches Parish. Ira Sylvester, Engr., Alexandria.

**Boston, Mass.*—Wm. Jackson, City, Engr., writes that G. W. & F. Smith Iron Co., of Boston, has secured the contract for c. i. fascias for the Cambridge Bridge for $11,375 and Jas. J. Coughlan Constr. Co. has secured the contract for abutments, etc., for the Brookline St. bridge for $29,300.

Muir, Mich.—Bids will be received until June 26 by E. S. Fuller, Deputy Township Clk., Lyons, for furnishing materials and constructing a steel or reinforced concrete bridge over the Maple River at Prairie St., Muir.

Paterson, N. J.—Press reports state that bids will be received until June 22 by the Joint Com. of Freeholders from Passaic and Bergen Co.'s for constructing the Passaic drawbridge.

Jersey City, N. J.—Bids will be received until June 19 by the Bd. Chosen Freeholders at Jersey City for building a new center pier, a new draw span, new resting piers and painting of the fixed spans of the Newark Ave. Bridge across the Hackensack River. John P. Noonan, Deputy Clk.

Allenhurst, N. J.—Bids will be received until June 19 by the Co. Bd. Chosen Freeholders (John Guire, Dir.) at Packers Hall, Seabright, for constructing a steel or iron bridge over Deal Lake, between Allenhurst and Interlaken.

New York, N. Y.—Bids will be received until June 20 by Louis F. Haffen, Pres. Boro. Bronx, for constructing approaches to bridges over the N. Y. C. & H. R. R. and the N. Y. & Putnam R. R., at Depot Pl. and 177th St. Engineer's estimate: 6,200 cu. yds. excav.; 30,500 cu. yds. filling and back filling; 1,950 cu. yds. dry rubble masonry; 9,410 cu. yds. concrete; 3,400 lin. ft. new curb; 16,800 sq. ft. new flagging; 4,250 sq. yds. granite block pavt.; 4,000 sq. yds. macadam pavt.; 278,000 lbs. iron and steel; 19,000 lbs. reinforcing bars; 3,800 sq. ft. woven wire fabric; 2,020 lin. ft. ornamental railing, etc., in Boro. Bronx.

New York, N. Y.—See "Paving and Roadmaking."

Dayton, O.—F. M. Turner, City Engr., writes that the following are the bids opened on June 6 by the Bd. of Pub. Service for constructing a concrete steel bridge across Great Miami River at Washington St.: *a* For constructing concrete steel bridge complete except brick and cement paving and curb; *b* 2,868 sq. yd. brick paving; *c* 10,396 sq ft. cement paving; *d* 1,434 lin. ft. cement curb; *e* piles for foundations, per lin. ft.; *f* grand total: Frank J. Cullen, Chicago, Ill., *a* $109,945, *b* $1.60, *c* 15 cts., *d* 50 cts., *e* 30 cts., *f* $116,810; Gabler & Dieter, Dayton, *a* $116,238, *b* $1.55, *c* 9 cts., *d* 45 cts., *e* 80 cts., *f* $122,264; The Williams Bros. & Morse Co., Cleveland, *a* $117,500, *b* $1.50, *c* 15 cts., *d* 45 cts., *e* 45 cts., *f* $124,007; Shailer & McCormick, Boston, Mass., *a* $117,950, *b* $1.70, *c* 11 cts., *d* 40 cts., *e* 65 cts., *f* $124,543; H. E. Talbott & Co., Dayton, *a* $123,000, *b* $2.25, *c* 10 cts., *d* 50 cts., *e* 75 cts., *f* $131,210; New Castle Bridge Co., Indianapolis, Ind., *a* $126,000, *b* $1.70, *c* 12 cts., *d* 38 cts., *e* 75 cts., *f* $132,668; Hoglen & Kline, Dayton, *a* $129,490, *b* $2.50, *c* 12 cts., *d* 50 cts., *e* 60 cts., *f* $138,625; J. P. Rusche, Grand Rapids, Mich., *a* $136,300, *b* $1.65, *c* 10 cts., *d* 30 cts., *e* 30 cts., *f* $142,502; Ed. Ryan, Springfield, *a* $160,200, *b* $1.80, *c* 12 cts., *d* 50 cts., *e* 50 cts., *f* $167,327.

Medina, O.—Bids will be received June 19 by the Bd. Co. Comrs. for furnishing materials and constructing the superstructure of a bridge over Rocky River in Liverpool Township, consisting of 1 span 120 ft. long, with 16-ft. roadway. Bidders may submit own plans and specifications if desired. W. H. Hobart, Co. Aud.

Bowling Green, O.—See "Paving and Roadmaking."

**Weatherly, Pa.*—The following bids are stated to have been opened by the County Comrs. on June 3 for constructing a bridge over Black Creek at Weatherly: Eyre Constr. Co., $15,200; Berlin Constr. Co., $14,790; J. P. Cowing Constr. Co., $14,450; Old Dominion Constr. Co., $14,000; New Jersey Bridge Co., $14,200; Penn Bridge Co., $13,575, and York Bridge Co., of York, $13,200 (awarded contract).

West Newton, Pa.—Bids for constructing a bridge over Youghiogheny River at West Newton are stated to have been opened by the Controller and Comrs. on May 25, as follows: Penn Bridge Co., $67,885; New Jersey Bridge Co., $75,825 Eyre Construction Co., $87,375 Owego Bridge Co., $88,000; King Bridge Co., $91,518; The Berlin Constr. Co., $93,820; Groton Bridge Co., $88,500; Champion Bridge Co., $78,950; Climax Road Machine Co., $68,832; American Bridge Co., $68,490; York Bridge Co., $92,400 Mt. Vernon Bridge Co., 2 bids, $73,210 and $78,360.

Philadelphia, Pa.—The Common Council is stated to have passed the ordinance providing for construction of bridges as follows: Allen Lane, over Wissahickon Ravine, $30,000; Walnut Lane, over Wissahickon Ravine, $190,000; under Chestnut Hill branch of the Pennsylvania R. R. at Gorgas Lane and Pleasant St., $70,000; under connecting railroad on the line of 25th St., $65,000; Front St., over the connecting railroad, $45,000; over Richmond branch of the Pennsylvania R. R. on line of Sedgely Ave., $40,000, and at northwest approach to Spring Garden St. bridge, $100,000.

**Catasauqua, Pa.*—L. J. Shimer, of Shimersville, Co. Comr., writes that the contract for constructing a steel highway bridge over Lehigh River at Catasaqua (bids opened May 27) has been awarded to the York Bridge Co., of York, for $87,590.

Castlewood, S. D.—It is stated that bids will be received by the Comrs. (J. A. Meadows, Chmn.), until July 11 for constructing a steel bridge here.

Racine, Wis.—P. H. Connolly, City Engr., writes that bids will be received June 17 for constructing a bridge at Main St., to cost $106,000.

Madison, Wis.—See "Public Buildings."

**Victoria, B. C.*—The B. C. General Contract Co., of Vancouver, is stated to have received the contract for replacing the wooden piers of the Canadian Pacific Ry. bridge over the Pitt River with concrete, for about $40,000.

PAVING AND ROADMAKING.

Notes Arranged Alphabetically by States.

**Little Rock, Ark.*—The Nashville Paving & Roofing Co., of Nashville, Tenn., is stated to have received the contract for paving about 16,000 sq. yd. with vitrified brick on E. 9th St., at about $30,000.

Santa Rosa, Cal.—City Clk. C. D. Clawson has been authorized to secure bids for a rock crusher of two sizes and a street road roller of 10 tons capacity.

San Francisco, Cal.—See "Sewerage and Sewage Disposal."

**San Francisco, Cal.*—Thos. P. Woodward, City Engr., writes that Flinn & Treacy, 302 Montgomery St., have secured the contract for widening Mission St. 8 ft. and paving same with basalt block from 2d to 5th St., at 39 cts. per sq. ft. for 10,331 sq. ft. basalt block gutters and 38.5 cts. per sq. ft. for 72,767 sq. ft. basalt block pavement; total cost, $39,650.

Grand Junction, Colo.—It is reported that bids will be received until June 17 by Chas. E. Burton, Supt. Streets, for furnishing materials and constructing about 11,400 sq. ft. cement sidewalks.

Bridgeport, Conn.—E. T. Buckingham, City Clk., writes that from $12,000 to $16,000 will be expended for paving. Brick or bitulithic pavement is favored and will probably be ordered latter part of June. W. W. Starr, City Engr.

Washington, D. C.—Bids will be received until June 15 by Capt. A. W. Butt, Dept. Q. M., U. S. A., Washington, for grading at Arlington National Cemetery, Va.

Key West, Fla.—Bids will be received until June 15 by W. R. Porter, Secy. Key West Realty Co., Key West,

**Items marked thus give the names of parties awarded contracts.*

for constructing 3 miles of road, 32 ft. wide, on the eastern end of the Island Key West.

Arcadia, Fla.—See "Water."

Boise, Idaho.—It is stated that bids will be received until June 27 by Idaho Inter Mountain Wagon Road Comn., Capitol, Boise, for building a wagon road from Warren to Big Creek; also for changing a portion of the road between Payette Lake and upper Payette Lake and for building a bridge across south fork of Salmon River. Address, Chas. W. Luck, Weiser, Idaho.

Sullivan, Ill.—The following bids are stated to have been received for paving with brick on Hamilton St.: Wolfe, Maupin & Curdie, of Alton, $33,889; Morrissey & Porter, of Paris, $33,683; Harshman Bros., of Sullivan, $33,266; J. H. Palmer, of Danville, $32,849; N. C. Finley, of Hoopeston, $32,841, and C. D. Fry & Co., of Newcastle, Ind., $31,789.

Chicago, Ill.—The Council Com. on Streets and Alleys is stated to have approved the ordinance providing for the paving with granite on a portion of Wentworth Ave.

**East St. Louis, Ill.*—John Landenburg, of East St. Louis, has secured the contract for grading Trendley Heights, a suburb east of East St. Louis.

Contracts for paving and sewering in Trendley Heights will soon be let. W. J. Crocker, Engr. in charge.

La Salle, Ill.—Joliet, Wright, 5th and Chartiers Sts. and St. Vincent Ave. will be paved this season, in all about 50,000 sq. yd. C. M. Rickard, City Engr.

**Shelbyville, Ind.*—E. C. Newton, City Clk., writes that Ballard & Metz, of Shelbyville, have secured the contract for constructing cement sidewalks on portions of 5 streets at 45 cts. per lin. ft., and Wm. Everard & Son, of Columbus, for gutter at 37 cts. per lin. ft.

Bedford, Ind.—W. M. Denniston, City Clk., writes that bids are wanted June 20 for paving J St. from 13th to 17th St. with vitr. brick or block.

*Walter G. Owens writes that the contract for constructing 19,875 ft. gravel or macadamized roads (bids opened June 5), has been awarded to S. R. Inmon, Burns City, Ind., for $8,138.

Des Moines, Ia.—It is stated that bids will be received until June 15 by the Bd. Pub. Wks., for paving with vitrified brick on Forest Ave., Charles and Grove Sts. John W. Budd, City Engr.

Louisville, Ky.—The Bd. of Pub. Wks. is stated to have decided to resurface portions of 4th Ave. and Walnut St. with asphalt, at an estimated cost of $9,000.

New Orleans, La.—The following bids are stated to have been opened May 29 for paving with asphalt on portions of *a* Carondelet St., *b* Josephine St. (price given per sq. yd.): Barber Asphalt Paving Co., *a* (2 bids) $1.94 and $1.92, *b* $1.92; Louisiana Improv. Co., *a* (2 bids) $1.90 and $2.10, *b* $2.01, and Sicilian Asphalt Paving Co., *a* (3 bids) $1.97½, $2.01⅔ and $2.03.

**Portland, Me.*—Spring and Portland Sts., Cumberland and Pleasant Aves. will be paved with the bitulithic pavement, contract having been awarded the Warren Bros. Co., of Boston, Mass.

Ft. Preble, Me.—Bids will be received June 19 by Capt. A. W. Yates, Q. M., U. S. A., Portland, Me., for constructing roads, gutters, walks and drains at Ft. Preble.

**Highlandtown, Md.*—H. G. Shirley, of Towson, County Road Engr., writes that the contract for paving Clinton St., Highlandtown, with Porter block (bids opened May 23) has been awarded to Nardin & Bresnan, of Baltimore, for $24,759. For list of bids received for this work, see issue of The Engineering Record of June 3.

**Erving, Mass.*—J. M. McCarthy, of Boston, Clk. Mass. Highway Comn., writes that the contract for building a section of state highway in Erving, about 5,400 ft. (bids opened June 1) has been awarded to Bruno & Milano, 293 North St., Boston, for $3,570.

**Somerville, Mass.*—Medford and Pearl Sts. and Gilman Sq. will be paved with bitulithic, contract having been awarded to the Warren Bros. Co., of Boston.

**Worcester, Mass.*—Contract has been awarded the Warren Bros. Co., Boston, to pave with bitulithic pavement Main St. from Hawthorne to Hammond and Bloomingdale Road.

Detroit, Mich.—The Bd. of Pub. Wks. is stated to have opened on May 29 bids for paving *a* Hale St., repaving *b* 6th St., *c* Porter St., *d* Miami, the following being the lowest bids received: Ferdinand Porath & Son, *a* with cedar block $4,168, *b* with cedar block $10,424; Barber Asphalt Paving Co., *c* with asphalt $15,267; Jas. Hanley, *d* with asphalt $12,384, with brick, $5,866; Russell & Jenison, *d* with kreodone block $22,430.

Lansing, Mich.—Gov. Warner is stated to have signed the bill providing for an appropriation of $90,000 for the improvement of state highways.

Mt. Clemens, Mich.—The citizens are stated to have voted to issue $28,000 paving bonds.

**Houghton, Mich.*—The contract for paving Huron and Isle Royale Sts. with cedar block is stated to have been awarded to Jas. J. Beyers, of Houghton, for $6,714.

**Ann Arbor, Mich.*—D. J. Ross, of Ann Arbor, has secured the contract for paving (bids opened June 3) at the following bid: 1,650 cu. yd. excav., 38 cts.; 70 ft. 4-in. Medina curb, 80 cts.; 2,550 lin. ft. 4-in. Berea curb, 45 cts.; 900 cu. yd. Portland cement concrete, $3.20; 4,950 sq. yd. sand cushion, 3 cts.; 4,950 sq. yd. brick paving, 97 cts., and 4,950 sq. yd. filler (asphalt and cement), 10 cts.

**St. Paul, Minn.*—The Barber Asphalt Paving Co. of Minneapolis has secured the contract for paving E. 84th St. with asphalt (bids opened May 29) for $11,218, the work to consist of 4,762 sq. yd. paving, 110 ft. granite curb, 1,850 ft. curb reset and 14 catch basin and manhole covers.

Concord, N. H.—Bids will be received June 22 by A. W. Dean, State Engr., Rumford Press Bldg., Concord, for grading and macadamizing a road in Salem and for grading and improving a road in Derry.

Weehawken, N. J.—The citizens are stated to have voted to issue $70,000 bonds for improving Bull's Ferry Road.

New Brunswick, N. J.—Bids will be received until June 28 by the Bd. Chosen Freeholders at New Brunswick (Asbury Fountain, Dir.) for constructing 3 stone roads and 1 gravel road, in all about 8 miles.

**New Brunswick, N. J.*—F. C. Schneider, City Surveyor, writes that the contract for grading, curbing and paving with brick on a portion of Hundy St. (bids opened May 1) was awarded on June 5 to B. M. Sweeten & Sons, of Camden. Cost reported to be about $10,000.

Jersey City, N. J.—Bids will be received until June 19 by the Bd. Chosen Freeholders at Jersey City for reconstructing and improving Newark and New York Turnpike from Bridge at Newark Ave., Jersey City to Frank Creek, in the town of Kearny; also Paterson Plank Road from Congress St. to Central Ave., Jersey City; also repairing damages and the protection from further damage of the roadway of the Weehawken Branch of the Hudson Boule., caused by quarrying operations on the lands of the Woodcliff Land Co. John P. Noonan, Deputy Clk.

**Kearny, N. J.*—The contract for macadamizing portions of Chestnut and Devon Sts. is stated to have been awarded to David Harper, 800 Broad St., Newark, for $1,734 and $6,108, respectively.

Newark, N. J.—The Bd. of Wks. is stated to have on May 1 opened bids for paving portions of streets, as follows (price given per sq. yd.): *a* Alpine St., *b* Roseville Ave., *c* Hunterdon St., *d* 5th St., *e* 2d St. and *f* Van Ness Pl. J. R. Shanley, with brick, *a*, *c*, *e* and *f* $2.18, *d* $2.20 with granite block, *e* and *c* $2.15; Wm. Van Keuren, with brick, *a*, *b*, *c*, *d*, *e* and *f* $2.27, with granite block, *c* $2.08, *e* $1.96; New Jersey Paving Co., with brick, *a* $2.22, *c* $2.20, *d* $2.25, *e* $2.32, *f* $2.26; Newark Paving Co., with brick, *a* $2.27, *b* $2.50, *c* $2.15, *e* $2.27, *f* $2.14, *d* $2.18 with granite block, *c* $2.16, *e* $2.09; Albert Lutz, with brick, *d* $2.16; Thos. O'Connor, with granite block, *c* $2.25, *e* $2.14; Essex County Constr. Co., with granite block, *c* and *e* $2.24; Barber Asphalt Paving Co., with asphalt, *c* and *f* $1.715.

New York, N. Y.—Bids will be received until June 20 by Louis F. Haffen, Pres. Boro. Bronx, for paving a portion of Hewitt Pl. and repaving a portion of E. 149th St., foundation to be of concrete. Engineer's estimate: 3,435 sq. yds. completed asphalt pavt., including binder course, and keeping the pavt. in repair for 5 yrs. from date of acceptance; 555 cu. yds. concrete; 625 lin. ft. new curb, furnished and set in concrete, etc.; also same date for regulating, grading, curbing, flagging sidewalks, etc., on a portion of Bryant Ave. Engineer's estimate: 9,800 cu. yds. earth excav., 10,150 cu. yds. filling; 6,800 cu. yds. rock excav.; 9,350 lin. ft. new curb, furnished and set; 37,700 sq. ft. new flagging, furnished and laid, etc., all in Boro. Bronx.

New York, N .Y.—See "Bridges."

New York, N. Y.—The following are the bids opened June 1 by the Park Comrs. for furnishing, setting and resetting curbs, paving with asphalt blocks portions of Cathedral Parkway and the Plaza; (*a*) Asphalt Constr. Co., 137th St. and Madison Ave.; (*b*) Barber Asphalt Paving Co., 114 Liberty St.; (*c*) Harlem Contr. Co., 41 Wall St.:

	a	*b*	*c*
3,415 lin. ft. 8-in. bluestone curb.	$1.25	$1.82	$2.25
750 lin. ft. old 6-in. curb. redressed and reset........	.50	.70	.80
2 receiving basins...........	125.00	250.00	200.00
1 catch basin	75.00	100.00	100.00
3,720 cu. yds. excav. earth or rock	1.00	.60	1.35
1,920 cu. yds. concrete......	5.00	4.75	6.80
15,350 sq. yds. asphalt block	1.39½	1.32	1.09
Total	$39,702	$38,609	$43,593

New York, N. Y.—Gov. Higgins has signed the bill providing for the widening of Pelham Ave. and construction of a bridge over the tracks of the New York & Harlem R. R.

Brooklyn, N. Y.—Bids will be received until June 15 by the Bd. Park Comrs., New York City (John J. Pallas, Comr.) for erecting and completing the steps and approaches to the eastern parkway front of the Brooklyn Inst. of Arts and Sciences; also for constructing roadway and walks in rear of said building, Boro. Brooklyn.

Brooklyn, N. Y.—The following are the bids opened June 1 by the Dept. of Parks, N. Y. City, for furnishing material and laying cement sidewalks on *a* Highland Boule., Eastern Parkway extension and around Stuyvesant Park, and *b* same work around Red Hook, City, Cuyler and Linton Parks: Chas. Cranford, 44 Court St., *a* $11,221, *b* $9,800; Danl. Douglass, 122 Logan St., *a* $13,894, *b* $13,831; Josiah T. Rutaw & Co., 4 and 5 Court Sq., *a* $15,077, *b* $13,499; Unique Constr. Co., 291 3d Ave., *a* $13,472, *b* $10,718; The Wilson & Baille Mfg. Co., 26 Court St., *a* $18,119, *b* $12,425.

Ft. Ontario, N. Y.—Capt. W. M. Coulling, Q. M., U. S. A., Oswego, writes that the lowest bid opened on May 27 for constructing roads and walks at Ft. Ontario, N. Y., was submitted by Mosier & Summers, 1266 Seneca St., Buffalo, N. Y.

Wellsville, N. Y.—F. M. Leonard, City Clk., writes that it was voted June 1 to issue $37,880 bonds for paving portions of N. Main, Depot, E. Fassett and E. State Sts.

Buffalo, N. Y.—Bids will be received June 15 by the Dept. Pub. Wks. (Francis G. Ward, Comr.) for paving portions of Alabama, Stanislaus and Harmonia Sts.; also, same date, for repairing the timber and planking of roadways and walks of all bridges and approaches and the walks and stairways of all viaducts maintained by the city of Buffalo.

*Henry P. Burgard, 560 Walden Ave., has secured contract for laying all concrete walks for the year ending June, 1906, at 11¾ cts. per foot (bids opened May 19).

**Elmira, N. Y.*—The contract for paving with asphalt on 6-in. concrete found. Maple Ave. (bids opened May 22) and Clinton St. (bids opened June 1) has been awarded to Costello & Neagle, of Elmira, at $2.15 per sq. yd.

Batavia, N. Y.—The paving of Main and Jackson Sts. with brick is reported under consideration; probable cost of improvement, $37,000.

**Oxford, N. Y.*—Frank Pidgeon, of Saugerties, is stated to have received the contract for constructing a macadam road in Oxford, for $10,003.

Syracuse, N. Y.—The Common Council is stated to have approved the ordinance providing for the paving of a portion of Park Ave. with brick, block or asphalt pavement. According to reports bids will soon be received.

**Gloversville, N. Y.*—The Hastings Pavt. Co., 25 Broad St., N. Y. City, has secured the contract for paving (bids opened June 5) at the following bid: 9,100 sq. yds. asphalt block, complete, $2.27; 5,490 lin. ft. reset curb on concrete, 20 cts.; 1,200 lin. ft. cinders under curb, 4 cts.; 50 cu. yds. extra concrete, $4; 1,550 cu. yds. extra excav., 30 cts.; total, $22,468. The other bidders were: John R. Baxter, Jr., 62 Lansing St., Utica, $25,152; Cameron-Hawn Realty Co., 608 Central Ave., Albany, $25,546; Albert M. Banker, Gloversville, $25,750; D. I. Snell & Co., Fonda, $26,607, and A. Schaupp, 255 Central Ave., Albany, $27,477. The Warren Bros. Co., Boston, Mass., bid for bitulithic pavement, $21,513.

**Cincinnati, O.*—The following are the bids opened May 29 by the Bd. of Pub. Service for paving a portion of Park Ave. with asphalt, 5,120 sq. yd.: Barber Asphalt Paving Co., Traction Bldg., $6,867; Kirchner Constr. Co., $7,053; Cleveland Trinidad Paving Co., $7,599, and Henkel & Sullivan, $7,362.

Bids will be received by the Bd. Pub. Service (Geo. F. Holmes, Clk.) until June 19 for furnishing material and grading, curbing and paving with brick on Espanola St. from Louisa St. to Harriet St., and with granite from Freeman Ave. to Louisa St.

Portsmouth, O.—Bids will be received June 28 by the Bd. Pub. Service (John M. Wendelken, Clk. pro tem.) for furnishing materials and improving portions of Lincoln and 6th Sts. by grading, curbing and paving with hard-burned or vitr. brick, asphalt, asphalt block or tar macadam. Approximate quantities: 12,929 sq. yd. paving, 5,496 lin. ft. straight curb, 888 lin. ft. 20, 18, 15 and 12-in. sewer pipe, 6 manholes, 20 catch basins, etc. R. A. Bryan, City Engr.

Cincinnati O.—Bids will be received June 14 by the Bd. Pub. Service (Geo. F. Holmes, Clk.) for furnishing materials, grading, curbing and paving a portion of Lawrence and McAllister Sts. with bitulithic; also, on June 28, a portion of Linwood Ave. with same material.

**Marysville, O.*—Jardine, Brewer & Tomlinson, of Chillicothe, are stated to have received the contract for paving with Bolen block N. and S. Court Sts., at $1.20 per sq. yd.

Bowling Green, O.—Bridge and paving bonds amounting to $90,000 are reported sold.

Cleveland, O.—It is stated that bids will be received until July 1 by the Co. Comrs. for grading, draining and paving with brick on South Rocky River Bridge approach. Wb. H.. Evers, Co. Engr.

It is stated that bids will be received until June 13 by the Bd. Pub. Service (A. R. Callow, Secy.), for raising grade and repaving Ridge Ave. approach to bridge on Denison Ave.

Napoleon, O.—It is stated that bids will be received until June 20 by F. J. Beck, Co. And., for constructing roads.

East Liverpool, O.—Bids will be received until June 22 by the Trus. of Liverpool Township (John H. Harris, Chmn.) for paving with brick on a portion of Calcutta Road. Approximate quantities: 9,543 sq. yds. paving, 10,736 lin. ft. broken stone, lateral support, 200 lin. ft. brick or concrete culvert and 2,100 lin. ft. 6-in. terra cotta sewer pipe. Willis Davidson, Township Clk.

Alliance (P. O. Northampton), Pa.—Bids will be received until June 15 by the Boro. of Alliance (H. T. Bilheimer, Secy.) for improving certain streets, including 22,000 sq. yds. macadam pavement, 12,500 lin. ft. concrete curb and gutter, 750 lin. ft. vitrified pipe, storm water sewer and appurtenances. The Lehigh Eng. Co., 323 Commonwelath Bldg., Allentown.

**Pittsburg, Pa.*—The contract for constructing and delivering a municipal asphalt repair plant (bids opened May 22 by the Dept. Pub. Wks.) is stated to have been awarded to the Kelly Road Roller Co. of Springfield, O., for $9,631.

The County Comrs. are stated to have adopted resolutions on June 2 providing for the improvement of the following county roads: Lowries Run and Mt. Nebo near Sewickley, Carnegie and Oakdale, Third Degree and Gibsonia, Monongahela and Elizabeth, Roberts Run. The probable cost of improvements is $250,000.

Bellevue, Pa.—Bids will be received until June 15 by the Boro. Council (J. M. Simeral, Clk.) for paving portions of Orchard and Hawley Aves., Howard and Vine Sts. and Hallett Pl., requiring 16,380 sq. yd. paving, 11,220 lin. ft. stone curb and 12,160 cu. yd. grading; John McBride, Engr., 46 Fidelity Bldg., Pittsburg.

**Tacoma, Wash.*—The contract for paving with asphalt Jefferson St. (bids opened June 1) has been awarded to the Independent Paving Co., Natl. Bank of Commerce Bldg., for $13,200.

The Independent Asphalt Paving Co., Natl. Bank of Commerce Bldg., is stated to have received the contract for paving N. 4th and N. 5th Sts., for $11,387.

**Freeport, Ill.*—The following are the bids opened by the Bd. of Local Improv. June 3 for paving Liberty St. with brick: (*a*) Smith & Brown, 78 La Salle St., Chicago; (*b*) G. Moffiali, Rockford, Ill.; (*c*) Chas. M. Porter, Chicago; (*d*) Rink & Schnell, Dixon; (*e*) Davenport Constr. Co., Davenport, Ia.; (*f*) Michaels & Munnich, Marion, Ind.; (*g*) Wm. Ascher, Freeport, Ill.; (*h*) M. Ford, Cedar Rapids, Ia. (awarded contract.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
21,334 sq. yd. pav., Purington block............	$1.47	$1.38	$1.49	$1.41	$1.50	$1.33	$1.28	$1.33
" " " Clinton block	1.48	1.38	1.46	1.42	......	1.35	1.29	......
" " " Barr block	1.48	1.38	1.50	1.42	......	1.34	1.29	......
11,460 lin. ft. curb and gutter................	.42	.40	.46	.45	.48	.38	.40	.37
15,390 cu. yd. excavation......................	.25	.30	.20	.28	.30	.22	.27	.22
300 lin. ft. 12-in. sewer.....................	.90	.60	.75	.60	.87	.45	.75	.50
12 intakes	25.00	18.00	20.00	22.00	22.00	22.00	18.00	16.00
Total...............................	$40,592	$38,928	$40,602	$39,376	$42,644	$36,514	$36,388	$36,342

Items marked thus give the names of parties awarded contracts.

Central City, W. Va.—Bids are wanted June 21 for paving Washington St. with vitrified brick, about 34,500 sq. yd., as advertised in The Engineering Record.

Baraboo, Wis.—It is stated that bids will be received by the City Clk. until June 14 for constructing macadam pavements and concrete gutters, crossings, approaches, etc. on 2d St. and 2d Ave. Geo. Andrews, Chmn. St. Com.

Ft. D. A. Russell, Wyo.—It is stated that bids will be received until June 15 by Capt. W. S. Scott, Q. M., U. S. A., Cheyenne, Wyo., for constructing about 14,000 sq. ft. of sidewalks at Ft. D. A. Russell.

**Toronto, Ont.*—Contracts for bitulithic pavement for Bismarck Ave., Gerrard and Charles Sts. and Dunbar Road have been awarded to Warren Bros. Co., of Boston, and to the Central Bitulithic Paving Co., of Detroit, Mich., for bitulithic pavement in Roxboro St.

The City Council has directed that bids be received for bitulithic pavement to be laid in Defoe St., Scarth Road, Bain Ave., Frederick St. and Pape Ave., all of the above work being ordered in recognition of petitions for bitulithic pavement signed by the owners of more than two-thirds of the frontage on each street.

Niagara Falls, Ont.—Bids will be received by the City Council June 17 for constructing Sec. No. 2, Niagara Falls paving system; approximately $5,900 sq. yds. brick pavt. on concrete foundation, resetting curb in concrete, and including all appurtenances. John Robinson, City Clk.

POWER PLANTS. GAS AND ELECTRICITY.

Notes Arranged Alphabetically by States.

Blanche, Ala.—H. T. Henderson, of Durango, Col., is reported interested in the construction of a water power plant on Little River in Cherokee County.

Rogers, Ark.—The Rogers Light & Water Co., of Rogers, is reported incorporated, with a capital of $100,000. W. R. Felker, Pres., and F. F. Freeman, Vice-Pres.

Warren, Ark.—Fred Purcell, Pres. Warren Light & Water Co., writes that the company has contracted with a local manufacturing company for water and electricity, and will only have to wire and pipe the town, and is now ready for bids for the material required for this work; probable cost of work, $12,000.

Oceanside, Cal.—The Oceanside Electric Light Co. is reported incorporated with a capital of $20,000, to furnish light for the beach district. Incorporators: R. H. Fitzgerald, J. T. Boyd, Henry B. Young and others.

Ukiah, Cal.—It is reported that a franchise has been applied for by A. Brown for the right of way, erection of poles, etc., for the transmission of electricity for power, etc., over roads between Elk and Gualala, and bids for said franchise will be received until July 3 by the Bd. Superv. (Hale McCowen, Clk.).

Ft. Bragg, Cal.—It is reported that the Ft. Bragg Electric Light Co., Inc., has applied for a franchise to construct and operate an electric plant for generating electricity to furnish heat, light and power for this city, and that bids for said franchise will be received on June 26 by the Bd. Trus. (Sam J. Zerbe, Clk.).

Santa Ana Cal.—It is stated that bids will be received until July 3 by Edw. Telford, City. Clk., for $57,000 electric light and power bonds.

Ventura, Cal.—C. E. Moore, of Santa Clara, is reported to have been selected to prepare plans and estimates for water works and an electric light plant for Ventura.

**Washington, D. C.*—Contracts for furnishing and installing electric light plant at the filtration plant (bids opened May 20) are stated to have been awarded as follows: Class B, for engines, generators, switchboards, etc., to Thos. W. Power, of Washington, for $6,069; Class C, for material and labor to complete duct system, to the Brennan Constr. Co., Washington, tor $7,544, and Class D, for wiring, etc., including all material and labor not included in the other classes, to the National Electric Supply Co., Washington, for $32,299.

*The Potomac Electric Power Co. is stated to have secured the contract for arc lights in certain public parks at $85 per light per yr., or a total of $5,525.

Columbus, Ga.—Press reports state that the Westinghouse Electric & Mfg. Co., of New York, N. Y., is preparing plans, specifications and estimates for the construction and equipment of the Chattahoochee electric plant for Stone & Webster, of Boston, Mass.

Monticello, Ga.—The citizens are reported to have voted May 30 to issue $30,000 bonds for an electric light plant, water works and sewerage system.

Cartersville, Ga.—The Etowah Power Co., of Gainesville, is reported to have purchased the property of the Etowah Development Co., with privilege to develop and control the water power of Etowah River. It is stated that a survey of the property will be made at once. Engineer, W. A. Carlisle, of Gainesville.

Roseville, Ill.—C. J. Boyd and Frank Lee are reported interested in the construction of a gas plant.

Pana, Ill.—The Pana Gas & Electric Co. is reported incorporated, by T. F. Russell, Wm. Pierce and others, to manufacture electricity for light, heat and power.

Crawfordsville, Ind. — The Water & Light Co. is reported to have decided to expend about $125,000 in improvements.

Logansport, Ind.—The Logansport & Wabash Valley Gas Co. is reported to have decided to construct an artificial gas plant in Logansport.

Ft. Wayne, Ind.—The Logansport & Wabash Valley Gas Co. is reported to have decided to construct a gas plant at Ft. Wayne.

Chetopa, Kan.—A. R. Bell, City Clk., writes that the proposed water works and electric light plant to cost $29,500. No engineer has been selected yet.

Abbeville, La.—Bids will be received by the Bd. of Aldermen (Geo. W. Summers, Secy.) July 3 for the purchase of $40,000 bonds, to be used for the construction of water works, sewerage system and electric light plant, as advertised in The Engineering Record.

Baton Rouge, La.—It is reported that the Baton Rouge Gas & Electric Co. will double the capacity of its plant.

Portland, Me.—Bids will be received by Capt. A. W. Yates, Q. M., U. S. A., Portland, on June 20 for an electric light and power distributing system at Ft. McKinley, Me., also for the construction of band barracks at Ft. Williams, Me., as advertised in The Engineering Record.

Bangor, Me.—Farson, Leach & Co., of New York, N. Y., are reported to have decided to finance and develop the property of the Bodwell Water Power Co., in Oldtown and Milford. The company will at once construct a concrete dam and an electric power plant to generate about 6,000 h.p. in addition to present development.

Baltimore, Md.—Bids will be received by the Bd. of Awards (E. Clay Timanus, Pres.) until June 14 for furnishing illuminating gas for all the city street and outdoor gas lamps and for use by city for all public buildings.

Elkton, Md.—Engr. B. F. Groff, an agent for Wm. T. Warburton, of Elkton, is stated to have purchased the mills and water power at Gilpins Falls, near Bayview, which will be developed for illuminating and manufacturing purposes.

**Springfield, Mass.*—The Springfield Electric Co., of Springfield, is reported to have secured the contract for electric wiring the new technical high school, for $4,700.

Republic, Mich. — The citizens are reported to have voted May 31 to issue $20,000 bonds for water works and an electric light plant.

Jackson, Mich.—The Dirs. of the Capital Light & Power Co. are reported to have decided to expend about $8,000 for new machinery.

Winona, Minn.—The Winona Gas Co. is reported to have decided to enlarge its plant.

Starkville, Miss.—Bonds to the amount of $8,000 are reported sold, to be used for enlarging the water and light plant. F. M. Cummings, City Clk.

Highlands, N. J.—Bids will be received by the Mayor and Council on June 26 for the construction of water works and an electric light plant, as advertised in The Engineering Record. Tunis H. Lane, Boro. Clerk. Engineers, Runyon & Carey, 122 Market St., Newark.

New York, N. Y.—Bids will be received June 19 by C. B. J. Snyder, Supt. School Bldgs., for installing electric equipment in School 40, Boro. Bronx.

Brooklyn, N. Y.—Bids will be received June 19 by C. B. J. Snyder, Supt. School Bldgs., New York City, for installing electric equipment in addition to and alterations in School 103, Boro. Brooklyn.

Long Island City, L. I., N. Y.—Bids will be received until June 19 by C. B. J. Snyder, Supt. School Bldgs., New York City, for installing electric equipment in addition to and alterations in School 1, Boro. Queens.

West New Brighton, S. I., N. Y.—Bids will be received until June 19 by C. B. J. Snyder, Supt. School Bldgs., New York City, for installing ventilating and heating apparatus and electric equipment for addition and alterations in School 18, Boro. Richmond.

**Long Island City, L. I., N. Y.*—The Commercial Contr. Co., 1 Madison Ave., N. Y. City, has secured the contract for the electric equipment of School 82, Queens Boro. (bids opened June 5) for $5,187.

Freeport, L. I., N. Y.—The Village Trus. are reported to have granted the Seaboard Gas Co. a franchise for a gas plant.

Queensbury, N. Y.—The Adirondack Power Co. has been incorporated, with a capital of $200,000 and principal office at Queensbury, to supply electric light and power in Albany, Essex, Fulton, Hamilton, Montgomery, Rensselaer, Saratoga, Washington and Warren Counties. Directors: Geo. F. Underwood and Fred. H. Parks, of N. Y. City; Geo. R. Finch and Maurice Hoopes, of Glens Falls.

Buffalo, N. Y.—The Economy Light, Fuel & Power Co. has been incorporated with a capital of $250,000, to furnish gas, electricity and steam in the cities of Buffalo and Lockport, and in Erie and Niagara Counties. Incorporators: Isaac H. Babcock and Burt Hall, of Lockport; B. F. Seadler, of N. Y. City, and others.

Cazenovia, N. Y.—The Cazenovia Electric Co. is reported incorporated, with a capital of $30,000, by Henry Burden and Robt. F. Hubbard, of Cazenovia, to manufacture electricity for light, heat and power.

Batavia, N. Y.—The Genesee County Electric Power & Gas Co., of Batavia, has been incorporated, with a capital of $100,000, to manufacture and distribute electricity in Genesee County. Incorporators: Simon B. Storer, of Syracuse; Raymond M. Walker and C. Clifton Bradley, of Batavia.

Lake Placid, N. Y.—This village proposes to construct a masonry dam on west branch of Ausable River and develop a water power with a 35-ft. head for operating the municipal electric light plant. A 125-h.-p. high-speed engine will also be installed, to be used at low water only. It is also proposed to construct a 5,000,000-gal. reservoir and a pumping plant. The pumping plant will have a power pump driven by electric motor and a steam pump, each pump to have a capacity of 1,500,000 gal. in 24 hours. Engr., Chas. E. Collins, Drexel Bldg., Philadelphia, Pa.

**Tonawanda, N. Y.*—The Tonawanda Power Co. is reported to have secured the contract for lighting the streets and parks with 120 arc lamps for 5 yrs., at $70 per lamp per yr.

Albany, N. Y.—The Hudson River Power Co. is reported to be preparing to add to its capacity by the construction of a dam across the Sacandaga. It also proposes building dams on the Schoharie.

The Racquette River Transmission Co. is reported incorporated, with a capital of $50,000, to manufacture electricity for light, heat and power in Albany, Rensselaer, Columbia, Saratoga, Green, New York and Kings Counties. Incorporators: Leroy S. Bradford, of Broadalbin; Lorenzo N. Rider, of Bath, and others.

Southold, N. Y.—The Southold Lighting Co., of Southold, is reported incorporated, with a capital of $6,000, by Jos. H. Marshall, Frank R. Mitchell, Lester Albertson and others, of Southold.

Northampton, N. Y.—The Sacandaga Power Co. has been incorporated, with a capital of $6,000, by Wm. Harris and John A. Cole, of Northville, and Geo. N. Ostrander, of Albany, to supply electricity in Northampton.

Potsdam, N. Y.—The Hydraulic & Electric Power Co. has been incorporated, with a capital of $50,000, to operate in St. Lawrence, Franklin and Jefferson Counties. Directors: Geo. W., Rufus L. and Chas. F. Sesson, all of Potsdam.

Lockport, N. Y. — The Niagara, Lockport & Ontario Power Co. is reported to have purchased a site for its $100,000 transformer station.

Williamson, N. Y.—The Town Trus. are reported to have granted the Sodus Gas & Electric Light Co. a franchise to light the village.

**Binghamton, N. Y.*—The Binghamton Light, Heat & Power Co. is stated to have secured the contract for 366 or more incandescent street lights, of not less than 105-watt power, at $21.50 per light per yr.

Olean, N. Y.—The Natural Gas, Electric Light, Heat & Power Co. is reported incorporated to furnish electricity and natural gas for light and fuel; capital, $50,000. Incorporators: Wilson R. Page, Fred R. Eaton and Jos. L. Page, all of Olean.

Youngstown, O.—Bids will be received until June 19 by the Bd. Pub. Service (G. T. Prosser, Clk.) for constructing an electric light plant complete for water works, pumping station and filter plant.

**Newark, O.*—The Westinghouse Electric Co., Pittsburg, Pa., is stated to have secured the contract for generator, switchboard, arc lamps and regulating transformer for the municipal electric light plant (opened May 29) for about $12,510.

Plymouth, O.—W. A. Jeffrey, Village Clk., writes that it was voted June 1 to issue $6,000 bonds to improve water works and electric light plant.

Eugene, Ore.—The City Council is reported to have granted F. W. Waters a franchise for a gas plant.

Richland, Ore.—C. F. Hyde and W. H. Strayer, of Baker City, are reported interested in the construction of an electric light plant at Richland.

Alden, Ia.—T. R. Holmes, City Clk., writes that it was voted May 29 to grant an electric light franchise to the Paterson Heat, Light & Water Co. Engineer, C. A. Daw, Iowa Falls.

Ft. Mansfield, R. I.—Bids will be received June 15 by the Constr. Q. M., U. S. A., New London, Conn., for installing an electric lighting system and current required at Ft. Mansfield.

Central Falls, R. I.—The City Council is reported to have passed an ordinance appropriating $75,000 for the purchase of a site and the construction of a municipal electric light plant.

Dillon, S. C.—N. B. Hargrove, City Clk. and Treas., writes that it was voted June 1 to accept franchise recently granted to A. N. Walker and associates for water works and an electric light plant.

Cookeville, Tenn.—Bids will be received by the Town Council (O. K. Holladay, Recorder) on June 22 for furnishing material and constructing water works and an electric light plant, as advertised in The Engineering Record.

Chattanooga, Tenn.—The Chattanooga-Tennessee River Power Co. has filed with Registrar of Hamilton County a petition for a charter for the purpose of improving and developing the water power of rivers and streams in the state of Tennessee, and especially of Tennessee River in Hamilton and Marion Counties, for the purpose of manufacturing, selling and distributing electricity. Incorporators: Chas. E. James, Jos. C. Guild, Norris Hendrick and others.

Dallas, Tex.—The citizens are reported to have voted to issue $400,000 bonds for improving the water works, $100,000 for an electric light plant, also for the erection of new schools.

Columbus, Tex.—The Columbus Light Co. is reported incorporated, with a capital of $10,000, to supply light, power, etc. Incorporators: J. W. Towell, Carey Shaw and others.

Park City, Utah.—The Summit Electric Co. is reported formed, with a capital of $100,000, by Henry Shields, Willard F. Snyder and others of Salt Lake City, to distribute electric light and power in Park City.

**Janesville, Wis.*—A. E. Bagley, City Clk., writes that the contract for lighting the city with electricity has been awarded to the Janesville Electric Co., of Janesville, at $62 per light per yr. for 200 or more lights.

Ft. Mackenzie, Wyo.—Bids will be received until June 19 by Capt. Jas. S. Parker, Q. M., U. S. A., Sheridan, Wyo., for installing an interior and exterior electric lighting system at Ft. Mackenzie.

ELECTRIC RAILWAYS.

Notes Arranged Alphabetically by States.

Sacramento, Cal.—John Martin, Vice-Pres. of the California Gas & Electric Cor., is stated to have under consideration the construction of an electric railway. The proposed road will parallel the proposed electric line of the Southern Pacific R. R. from Stockton to Sacramento via Walnut Grove.

San Francisco, Cal.—It is reported that $350,000 has been set aside in the budget for the coming year for the conversion of the Geary St. Cable R. R. into an underground electric conduit road. The total cost has been estimated at $667,595. This is the first step in the acquirement of this road as a public utility, its franchise having expired, and its operation under public ownership.

**Washington, D. C.*—The contract for the completion of the line of the Great Falls & Old Dominion Ry. Co., which has been under course of construction, has been let to the Westinghouse Co. The contract calls not only for the completion of the road, but also for the equipment and erection of the power house at Rosslyn. John Leetch, Pres.

Chicago, Ill.—The Chicago & River Forest Ry. Co. is reported incorporated, with a capital of $10,000, to construct a line from Oak Park to a point in DuPage Co. Incorporators: Geo. W. Bryson, Fred W. McLean, Wm. J. Kenly and others, all of Chicago.

Huntington, Ind.—The Huntington, Upland & Matthews Traction Co. is reported incorporated to build an electric railway through Huntington, Van Buren, Upland and Matthews. Dirs.: O. S. Stout, J. A. Shafer, D. L. Horner.

**Items marked thus give the names of parties awarded contracts.*

Geneva, Ind.—The Town Council is stated to have granted a franchise to the Ft. Wayne & Springfield Traction Co.

Laporte, Ind.—The South Bend Western Ry Co. is reported incorporated, with a capital of $100,000. W. L. Taylor, Indianapolis, Pres.; M. H. Reed, South Bend, Vice-Pres.; W. W. Babcock, South Bend, Secy. It is proposed to construct an interurban line from South Bend to Laporte. It is proposed to acquire the interurban road now operating between Laporte and Michigan City. A line is also contemplated between New Carlisle and Michigan City.

Winona Lake, Ind.—It is stated that John B. Marshall, who has received the contract for construction and equipment of the Winona Interurban Ry., would like to have bids submitted for grading, track construction, pole and line work. Francis H. Ely, Supt. of Constr., is the representative at Winona Lake of Mr. Marshall.

Columbus, Ind.—It is stated that the Columbus St. Ry. & Light Co. will receive bids for the construction of a new power house and a central steam heating plant. Douglas Dowell, Ch. Engr.

Shelbyville, Ind.—Enos Porter, of Shelbyville, is reported interested in the proposed line from Shelbyville to Greensburg.

**Huntington, Ind.*—The American Engineering Co. of New York, N. Y., is stated to have received the contract for the construction and complete equipment of the proposed lines of the Huntington, Columbia City & Northwestern Traction Co. from Huntington to Goshen and eventually to South Bend. The probable cost of improvement is $1,500,000.

Grinnell, Ia.—The construction of an interurban railway from Grinnell to Belle Plaine is reported under consideration. Howard Cole, of Chicago, Ill., and others are stated interested in the project.

Abilene, Kan.—Plans to build an electric railway from Abilene to Fairbury, Neb., via Clay Center and Washington, are reported to be almost completed. It will be called the Golden Belt Electric line.

Hagerstown, Md.—It is stated that a franchise to construct an electric railway has been granted to John W. Feldman.

Newburgh, N. Y.—The Upper Hudson Electric & R. R. Co., of Newburgh, is stated to have been incorporated to operate an electric railway 25 miles long from Bethlehem to Catskill; capital, $500,000. Dirs: Luke F. Gillespie, Newburgh; Eugene Wolfe, Athens; T. M. Sheehan, Coxsackie, and others.

Auburn, N. Y.—The Auburn & Northern Electric Ry. Co. is reported to have received a franchise to construct a line in Clark, Jefferson and Orchard Sts.

Catawissa, Pa.—Preliminary surveys for the new Catawissa-Numidia Electric Ry. are reported to be in progress. The line from Numidia to Bear Gap will be built by the Coal Region Traction Co.

Mt. Pleasant, Pa.—The Uniontown & Monongahela Electric Ry. Co. is reported to have received a franchise It is stated that a new branch to Greensburg connecting Hecla and Youngwood will be built.

Jellico, Tehn.—The Jellico Electric Ry. Co. is stated to have effected a preliminary organization. The proposed line will begin at Newcomb, pass through Jellico, Williamsburg, Ky., and terminate at Corbin, Ky.

Chattanooga, Tenn.—A franchise to build an electric railway on several streets is reported to have been granted to J. W. Adams.

Sherman, Tex.—Plans for constructing an interurban electric railway from Sherman to Gainesville via Whitesboro are reported to have been practically perfected. The estimated cost of construction and equipment is stated to be about $800,000. The principal promoter is G. A. Hassinger, of New Orleans.

London, Ont.—The Southwestern Traction Co. is stated to have decided to enlarge its power house.

Chatham, Ont.—The Chatham, Wallaceburg & Lake Erie Electric Ry. Co. is stated to have purchased a site on King St. W. on which to build its proposed power house and general offices.

RAILROADS.

Notes Arranged Alphabetically by States.

Peoria, Ill.—The Milwaukee, Peoria & St. Louis Ry., of Chicago, has been incorporated, with a capital of $10,000, to construct a line from Peoria through the counties of Peoria, Tazewell, Woodford, Marshall, Putnam, Bureau, Lee, Ogle and Winnebago to Rockford. Incorporators: F. B. Johnstone, Thos. M. Headen, Wm. Burry, Thos. G. Vent and E. D. Frazer, all of Chicago.

**Indianapolis, Ind.*—P. E. Manchester, of Indianapolis, Asst. Engr. Lake Erie & Western R. R. Co., writes that contracts for constructing the subway (bids opened June 1) have been awarded as follows: The Marion County Constr. Co., Indianapolis, for all work except filling, track work, etc., and the superstructure of bridge work; railroad company will do the filling and track work. The New Castle Bridge Co., Indianapolis, secured the bridge work for the L. E. & W. R. R. and the C., I. & L. Ry., and the King Bridge Co., Cleveland, O., the bridge work for the Big Four R. R.; total cost of work about $100,000.

Talala, Ind. Ter.—The directors of the Kansas City, Tuscaloosa & Southwestern R. R. Co. are reported to have increased the capital from $2,000,000 to $5,000,000 and voted to build a line from Talala, Ind. Ter., on the Iron Mountain road to Joplin, Mo.

Lake Charles, La.—The survey of the extension of the Southern Pacific R. R. (Wm. Hood, Ch. Eng., San Francisco, Cal.) from Lake Charles northward has just been completed. The road has its terminus just across Calcasieu River, a few miles north of the northern border of Vernon Parish.

Detroit, Mich.—The directors of the Detroit, Monroe & Toledo Short Line are reported to have decided to let the contract for double-tracking the system, including that portion of the road between Monroe and Toledo. It was also decided to extend the road to Adrian to connect with the proposed extension of the Detroit, Yipsilanti, Ann Arbor & Jackson from Yipsilanti to that place.

Highland Mills, N. Y.—The Erie & Jersey R. R. Co. is reported incorporated to build and operate a steam railway from Highland Mills to Guymard, a distance of 42 miles; capital, $600,000. Directors: F. D. Underwood, G. F. Brownell, F. C. Stetson, of N. Y. City, and others.

Wilmington, N. C.—The South Atlantic Terminal Co. is reported incorporated to construct and operate a railway between some point in New Hanover County and Southport, a distance of 30 miles, of which 3 miles are in New Hanover County and 27 in Brunswick; capital, $150,000. Incorporators: H. H. Dougherty, New York, N. Y. D. W. Bullock and J. H. Hinton, of Wilmington, and others.

**Devil's Lake, N. D.*—Winston Bros. are reported to have secured the contract for constructing a branch of the Minneapolis, St. Paul & Sault Ste Marie Ry. from Devil's Lake to Rock Lake, a distance of 50 miles.

Cincinnati, O.—At a recent meeting of the stockholders of the Cleveland, Cincinnati, Chicago & St. Louis R. R. (G. W. Kittridge, Ch. Engr., Cincinnati) the proposition recently made to increase the common stock from $28,700,000 to $40,000,000 was agreed upon. The proceeds of the new issue will go toward the improvement of the property; there is to be extension of the line into Chicago, which will be borne equally by the Lake Shore and the Big Four.

Hanover, Pa.—A corps of engineers is reported to have completed survey of the new route for the Wabash R. R. (W. S. Newhall, Ch. Engr., St. Louis, Mo.) through the South Mountains. Leaving the Western Maryland main line about Smithburg and extending through the Midvale region to Rouserville, via Fountaindale, the line will be tunneled through the mountain and thence to Emmitsburg, Md., where connection will be made with the Western Maryland branch and the line completed to Baltimore. The link is 12 miles long.

**Pittsburg, Pa.*—Contracts are stated to have been awarded by the Pennsylvania R. R. Co. for improvements on the Pittsburg division as follows: To Cadwallader & Robinson, of Philadelphia, for a double track on Sewickley branch from Youngwood to Boyer Run Junction for $60,000; Drake & Stratton, Philadelphia, two miles of siding at Lilly for $41,000. Improvements will also be made at Wilmore, Portage, Millwood, Grapeville, Homewood and Youngwood for watering locomotives.

PUBLIC BUILDINGS.

Notes Arranged Alphabetically by States.

Fresno, Cal.—It is stated that plans and specifications will be received June 19 by W. H. Ryan, Clk. Bd. Trus., for a city hall, cost not to exceed $75,000.

Greenbank, Del.—Bids will be received until June 15 by the Bd. Trus. of the New Castle County Workhouse (J. N. Gawthrop, Pres.) for furnishing material and erecting a workshop, dining room and female cell wing as an addition to the present building at Greenbank.

Washington, D. C.—Bids will be received until June 13 at the Bureau Supplies and Accounts, Navy Dept., for plumbing and gasfitting, heating, elevator work and lighting fixtures necessary for completing buildings for the naval hospital, Washington. Plans can be obtained upon application to Ernest Flagg, archt., 35 Wall St., New York, N. Y., on deposit of $15, of which sum $10 will be refunded on return of plans. H. T. B. Harris, Paymaster Gen., U. S. N.

Bids were received, it is stated, by the Comrs. D. C., on June 3, for erecting the east wing at the workhouse for males at the Washington Asylum (not including cells), (*a*) for building of red brick, (*b*) for light brick: W. E. Speer, *a* $50,000, *b* $53,000; Gleason & Humphrey, *a* $51,223, *b* $56,323; Brennan Constr. Co., *a* $54,300, *b* $56,400; Jennings & Scott, *a* $54,889, *b* $55,799; I. Pavarini, *a* $58,292, *b* $59,292.

Bids will be received June 13 at the Dept. of the Interior (E. A. Hitchcock, Secy.) for reconstructing the boiler room, Old Post Office Dept. bldg.; also same date for installing water-tube boilers in said building.

Bids will be received June 29 by Elliott Woods, Supt. U. S. Capitol Bldgs. and Grounds, for cut stone work for the exterior facade and the court walls of the office building, U. S. Senate; bids will also be received June 14 for certain brick work, including the backing up of the stone work in connection with the construction of the office building for the House of Representatives.

The following are the bids opened June 2 by the Bureau of Standards for extension of the temperature laboratory: Jennings & Scott, Washington, $17,599; Cramp & Co., Philadelphia, Pa., $15,526; J. S. Reynolds, Baltimore, Md., $16,597, and Norcross Bros. Co., Worcester, Mass., $16,634.

Chicago, Ill.—City Engr. Ericson, it is reported, recommends that the plumbing, drainage and ventilating of the city hall be thoroughly remodeled at a cost of $35,000.

Bids will be received until June 20 by the Bd. Pub. Wks. (Jos. M. Patterson, Comr.) for the structural steel and iron work, including stairways and railways for extension of iron platforms in the boiler room of the 14th St. Pumping Station.

Bids will be received by the Bd. of Inspectors, House of Correction, until June 20 for furnishing materials and erecting structural iron work, cut stone, slate and sheet metal work required on the new women's building, 26th St. and California Ave.

Chas. F. Hermann, the City Archt., has prepared plans for a cellhouse for women to be erected in connection with the House of Correction. The building will be of steel construction, 3 stories, 190x285 ft., and is estimated to cost $100,000.

Jarvis Hunt is preparing plans for the necessary buildings to be erected for the new naval training station on the North Shore, which, together with the real estate, will represent an outlay of about $2,500,000. There will be 18 buildings in all, similar to those at Ft. Sheridan. For building purposes $250,000 is now available, and it is understood that this will be used for the construction of the harbor and its protection.

**Pekin, Ill.*—The Iowa Mfg. Co. of Oskaloosa, Ia., has secured the contract for heating the U. S. Post Office (bids opened May 24) for $2,399.

South Bend, Ind.—Freyermuth & Maurer, of South Bend, are the architects for the poorfarm building to be erected near South Bend for the Bd. State Charities (Amos W. Butler, Secy., Indianapolis).

Shelbyville, Ind.—It is reported that bids will be received by the Bd. Co. Comrs. until June 28 for installing a steam heating plant in the court house and jail. Thos. Hawkins, Co. Aud.

Crawfordsville, Ind.—The following are the bids opened June 5 by the Superv. Archt., Treas. Dept., Washington, D. C., for construction complete of U. S. Post Office at Crawfordsville: W. J. Turner & Co., Chicago, Ill., $36,984; C. W. Gindele Co., Chicago, Ill., $37,775; J. E. Barnes & Co., Logansport, $39,900; J. A. Daly, Nevada, Mo., $39,990; L. O. Miller & Co., Middletown, Ind., $46,800; Edw. Henry, Lipton, Ind., $35,600; W. H. Baily, Henderson, Ky., $42,743; English Bros., Champaign, Ill., $39,599.

Petersburg, Ind.—The Co. Council has decided to erect a county infirmary at a cost of $15,000 instead of $25,000, as at first proposed.

Goshen, Ind.—It is stated that bids will be receeived until July 11 by the Co. Comrs. for erecting a county hospital.

**Ft. Riley, Kan.*—J. B. Betts, of Topeka, it is reported, has received the contract to erect a hospital at this post at $41,000.

Leavenworth, Kan.—The Sisters of Charity, it is stated, are preparing to erect a $50,000 hospital here. Rev. H. Friesberg may be able to give further information.

Portland, Me.—See "Power Plants, Gas and Electricity."

Baltimore, Md.—Bids will be received until June 21 by the Bd. of Awards (E. Clay Timanus, Pres.) for erecting an addition to the women's prison at the Baltimore City Jail.

Ft. Banks, Mass.—Bids will be received June 21 by Maj. John E. Baxter, Q. M., U. S. A., Boston, for furnishing materials, excavating and constructing necessary basement rooms and to furnish complete and install a steam heating system in Administration Bldg. at Ft. Banks.

Ft. Rodman, New Bedford, Mass.—See "Miscellaneous."

Detroit, Mich.—The State Fair Assoc., it is stated, will issue $100,000 bonds for improvements. The main building will be of brick and cement, suitable for use as a convention hall.

Battle Creek, Mich.—The Council Com. on the Police Dept., it is stated, has reported in favor of erecting a police station at a cost of $20,000.

Stillwater, Minn.—The State Bd. of Control at St. Paul, it is stated, is contemplating the erection of a new prison here, $75,000 having been appropriated for the purpose.

Cambridge, Minn.—It is reported that bids are wanted until July 12 for installing a steam-heating apparatus in the court house. T. C. Blongren, Co. Aud.

Duluth, Minn.—It is stated that the U. S. Engr. Corps will build a $15,000 monolithic concrete office building soon for the Lake Superior District headquarters. Maj. C. L. Potter, Corps Engrs., U. S. A., 519 Providence Bldg., Duluth, is officer in charge.

Coffeeville, Miss.—The Bd. of Superv., it is stated, intends erecting a jail at a cost of $15,000.

**Nevada, Mo.*—R. W. Mitchell, Secy. Bd. Trus. State Hospital, writes that the contract for erecting State Hospital No. 3 (bids opened June 2) has been awarded to J. A. Daly, of Nevada, for $31,450.

Savannah, Mo.—It is reported that bidds will be received until June 15 by Judge Christian Yenni for erecting a jail and sheriff's residence for Andrew Co.; probable cost, $15,000. Geo. E. McDonald, archt., Warrensburg.

Orange, N. J.—Plans prepared by E. C. Stout, of South Orange, it is stated, have been accepted by the Bd. of Directors of the Orange Memorial Hospital, for a 3-story addition, 80x34 ft., which is to be erected at a cost of $30,000. Bids for the construction, it is stated, will soon be asked.

Roswell, N. Mex.—It is stated that the Sisters of Mercy intend erecting a $20,000 hospital and sanitarium here. Rev. Father Herbert of St. Peter's may be able to give further information.

**New York, N. Y.*—The contract for boiler house at City Hospital, Blackwells Island (bids opened June 2) has been awarded to the York Contr. & Supply Co., S. E. cor. 28th St. and Broadway, for $21,800. Harry L. Philp, 166 E. 120th St., secured the contract for installing boilers and laying steam and water pipe in said building for $21,529.

Bids will be received until June 15 by the Dept. of Correction (Francis J. Lantry, Comr.) for furnishing 2 horizontal tubular boilers, etc., for the 2d Dist. Prison.

Bids will be received until June 20 by Nicholas J. Hayes, Fire Comr., for furnishing materials and installing equipment in the new repair shops, 56th St. and 12th Ave., Boro. Monhattan.

The Bd. of Aldermen on June 6 appropriated $170,000 for a new police station for the Tenderloin Prect.

Plans have been filed by McKim, Mead & White, Archts., 160 5th Ave., for that part of Bellevue Hospital to be known as Pavilions A and B, which are to be 6-story and basement, of brick with granite and limestone trimmings, and estimated to cost $600,000.

Brooklyn, N. Y.—Bids will be received until June 15 (readvertisement) by the Bd. Park Comrs. (John J. Pallas, Pres.), New York City, for erecting a shelter in Ft. Greene Park; also, same date, for shelters in Carroll, Bedford and Bushwick Parks and Irving Sq., all in Boro. Brooklyn.

New York State.—It is stated that of the $600,000 appropriated for enlarging the State's charitable institutions, Fiscal Superv. Bender will expend $90,000 for dormitories at the Craig Colony for Epileptics, $58,000 for 2 new dormitory cottages for the Asylum for Feeble-Minded Women at Newark; $60,000 for dormitories at the Rome Custodial Asylum; $40,000 to enlarge the reformatory for women at Bedford, and $28,000 to enlarge the reformatory for women at Albion.

The following bills have been signed by the Governor: Appropriating $35,000 for improvements to quarantine stations on Hoffman and Swinburne Islands, $75,000 for a state armory at Oswego, $175,000 for a state armory and stable at Syracuse, and $15,000 for repairs and improvements to the state armory at Geneva; also authorizing the Governor to appoint 5 commissioners to inquire as to the most practical method of providing modern prison buildings; to inquire as to the structural and sanitary condition of the buildings at Auburn and Sing Sing and cost of reconstructing and modernizing; as to the advisability and cost of constructing two new prison plants on new sites and the most practicable disposition to be made of the Eastern New York Reformatory.

***Items marked thus give the names of parties awarded contracts.**

Little Falls, N. Y.—The following are the bids opened June 1 by the Superv. Archt., Treas. Dept., Washington, D. C., for construction of U. S. Post Office at Little Falls: Fissel & Wagner, New York, $32,407; Dewitt A. Hays, Gloversville, $37,000; Campbell & Dempsey, Kingston, $39,800, and Hollman Bros., Little Falls, $33,659.

Comstocks, N. Y.—The Governor has signed a bill reappropriating $49,283 for the purchase of a site here and the preparation of plans for a hospital for the insane for the northeastern part of the state.

Binghamton, N. Y.—Bids will be received until June 28 by the State Comn. in Lunacy (T. E. McGarr, Secy.) at Albany for the construction, heating, plumbing and electric light wiring of an acute hospital and also chronic ward bldg. at the Binghamton State Hospital.

Plattsburg Barracks, N. Y.—Pennington & Butler, of Plattsburg, it is stated, submitted the lowest bids on May 27 to Capt. T. B. Lamoreaux, Constr. Q. M., Burlington, Vt., for erecting at the Military Post an administration building, addition to band barracks and an addition to shops, at a total bid of $41,000.

Ft. Ontario, N. Y.—Bids will be received June 16 by Capt. W. M. Coulling, Q. M., U. S. A., Oswego, for constructing, etc., post exchange and gymnasium and a Q. M. shop at Ft. Ontario, as advertised in The Engineering Record.

Watertown, N. Y.—The Co. Comrs., it is reported, are considering the issue of $40,000 bonds for improving the court house, for which plans have been prepared by D. D. Kieff, 24 Flower Bldg.

Ft. Wood, N. Y. H., N. Y.—Bids will be received June 20 by Capt. Traber Norman, Constr. Q. M., U. S. A., Governor's Island, N. Y. H., for erecting a post hospital at Ft. Wood, as advertised in The Engineering Record.

Grand Forks, N. D.—Bids will be received until June 27 by Jas. Knox Taylor, Superv. Archt., Washington, D. C., for furnishing steam heating apparatus complete in place, for the U. S. Post-Office and Court House at Grand Forks.

Columbus, O.—The Council is said to be considering the erection of a fire house at a cost of $70,000.

Cleveland, O.—The members of the Russian Greek Catholic Church of North America, it is stated, are contemplating the erection of an orphan asylum, probably in this city, at a cost of about $50,000. Rev. J. Kapanadze, of Cleveland, may be able to give further information.

It is stated that an addition is to be erected to the Dorcas Invalids' Home on E. Madison Ave. at a cost of $25,000.

It is reported that the trus. of the John Huntington estate will spend $500,000 for the erection of a library at Wade Park facing Euclid Ave.

**Celina, O.*—The contract for erecting a stone library (bids opened May 27) has been awarded to J. Tenant & Son, of Celina, for $10,609.

Elyria, O.—Bids will be received until June 17 by the Co. Comrs. for furnishing material and erecting a building on the grounds of the infirmary of Lorain County. G. H. Lewis, Co. Aud.

**Oil City, Pa.*—F. L. Stevenson Contr Co., of Dallas, Tex., has secured the contract for erecting the U. S. Post Office at Oil City (bids opened May 22) for $50,720.

**Charleston, S. C.*—F. B. Gilbreth, 34 W. 26th St., New York, N. Y., has secured the contract for erecting the new Roper Hospital for $109,375. Wm. Aiken, archt., 33 Union Sq., New York, N. Y.

Rock Hill, S. C.—The following are the bids opened June 6 by the Superv. Archt., Treas. Dept., Washington, D. C., for constructing complete U. S. Post Office at Rock Hill: R. A. Richardson & Son, Norfolk, Va., $34,839; E. Hart, Norfolk, Va., $34,131; General Supply & Constr. Co., New York, N. Y., $35,497; King Lumber Co., Charlottesville, Va., $34,745; H. T. Wardrup & Son, Knoxville, Tenn., $34,863; Moise De Leon, Atlanta, Ga., $32,000; Miles & Bradt, Atlanta, Ga., $36,216; Mankin Constr. Co., Richmond, Va., $35,012.

Savannah, Tenn.—H. E. Williams, Secy. Bldg. Com., Co. Comrs., writes that bids will be received June 14 for the erection of a court house here.

Ft. Monroe, Va.—Bids will be received until June 20 (change of date), by Capt. C. P. Townsley, Q. M., for constructing officers' quarters, plumbing, heating and electric wiring 3 single and 1 double officers' quarters, 7 double n. c. officers' quarters, cvommissionary Q. M. office and galvanometer house (all of brick), at this post.

Ft. Ethan Allen, Vt.—Bids will be received June 14 by Capt. G. C. Barnhardt, Q. M., U. S. A., for repairs to post hospital here.

Bellows Falls, Vt.—It is stated that Andrew Carnegie has offered this city $15,000 with which to erect a library.

**Darlington, Wis.*—Geo. F. West, Chmn. Bldg. Com., writes that the contract for erecting a 2-story stone court house (bids opened May 31) has been awarded to General Constr. Co., of Milwaukee, for $105,000.

Madison, Wis.—The Assembly has passed a bill appropriating $90,000 for the erection of a State tuberculosis sanitarium.

Warm Springs, Va.—The citizens, it is reported, are to vote on the question of erecting a $40,000 jail and court house.

Madison, Wis.—The Senate on June 1, it is stated, passed the bill of the committee on capitol and grounds, authorizing preliminary expenditures aggregating $658,000 for a new capitol building. It is reported that it has been decided to return the plans previously accepted and to again receive plans for the building.

The Senate also passed a bill on same date for improvements to be made to the State Fair Grounds, appropriating $60,000 to be distributed as follows: For erection of a live stock judging pavilion on the State Fair Grounds, $37,500; streets, drives and walks on fair grounds, $5,000; repairs on building, $10,000; for bridge under race track, $5,000.

Sheboygan, Wis.—It is reported that bids will be received until June 20 by Wm. Poenitz, Secy. Bd. Mgrs., for additions and alterations to the county insane asylum.

Medicine Hat, N. W. Ter.—The Council has adopted the plans submitted by W. T. Williams, of Medicine Hat, for the $30,000 municipal hospital which is to be erected on Main and 4th Sts.

London, Ont.—Bids will be received until June 20 by the Dept. Pub. Wks., Ottawa (Fred Gelinas, Secy.), for a military store building here. Wm. Ioanes, archt., 379 Queens Ave.

Hamilton, Ont.—The erection of a wing at the hospital is reported under consideration; probable cost, $40,000.

BUSINESS BUILDINGS.

Notes Arranged Alphabetically by States.

San Francisco, Cal.—Bliss & Faville, Crocker Bldg., are the archts. for a $100,000 hotel to be erected on Bush St. bet. Grant Ave. and Stockton St. for the Bush St. Improvement Co.

Los Angeles, Cal.—The directors of the Temple Auditorium Co., it is stated, have adopted the plans of Chas. F. Whittlesey and Otto H. Nehr (Assoc.), of Los Angeles, for the convention hall which is to be erected at 5th and Olive Sts. It is to be of reinforced concrete, 6 stories high, 165x110 ft., and is to cost about $350,000. Mattison B. Jones, Secy., 407 Douglas Bldg.

Denver, Colo.—An 8-story store and office building is to be erected at 16th and Champa Sts. according to plans prepared by Hunt & Hunt, of New York City, and is to be known as the Symes Interstate Bldg.

**Chicago, Ill.*—Jos. Haight, 904 Dearborn St., it is reported, has received the contract to erect all buildings on the Southern Indiana system, including roundhouses, shops, freight houses, and the passenger stations on the Indianapolis and Chicago divisions.

Champaign, Ill.—The Cleveland, Cincinnati, Chicago & St. Louis R. R. (G. W. Kittredge, Ch. Eng., Cincinnati, O.), it is reported, is contemplating improvements here to cost about $100,000, which will include the erection of a freight house.

Alton, Ill.—It is reported that plans have been prepared by Frank G. Newells for remodeling the Madison Hotel, the cost to be about $50,000. Hewitt & Watson, owners.

New Orleans, La.—A building permit has been granted to the New Orleans Terminal Co. to erect 3 brick sheds to be used as warehouses for the company. One is to be erected at Claiborne Ave., Prieur, St. Louis and Toulouse Sts. and is to cost $32,000; the other 2 are to be erected at St. Louis, Toulouse, Claiborne and Villere Sts. and will cost a total of $48,000.

New Orleans, La.—It is stated that the D. H. Holmes Co. is contemplating the remodeling of its building on Dauphin St. at a cost of about $100,000.

Baltimore, Md.—Edwin Faber, it is stated, has commissioned O. Kubitz to prepare plans for a 5-story warehouse to be erected at 339 North St. at a cost of $20,000.

Grand Rapids, Mich.—Heystek & Canfield Co., it is reported, intend erecting a 6-story warehouse here.

Minneapolis, Minn.—The La Crosse Implement Co., it is reported, has secured a site on 7th Ave. and intends erecting a 9-story warehouse at a cost of about $100,000.

The Pabst Brewing Co. will erect a 2-story brick restaurant at 242 Nicollet Ave., to cost $40,000.

Jackson, Miss.—It is reported that the Illinois Central R. R. (H. U. Wallace, Ch. Engr., Chicago, Ill.) intends erecting a new depot in this city.

St. Louis, Mo.—David Lauver, it is reported, is interested in the project to erect a $700,000 hotel in the downtown business dist.

Lincoln, Neb.—The erection of a Y. M. C. A. building at a cost of $30,000 is reported under consideration.

**Trenton, N. J.*—W. J. & J. H. Morris, it is stated, have secured a permit to erect a brick warehouse, 50x225 ft., which is to be erected for the Mott Iron Wks. at a cost of $20,000.

Atlantic City, N. J.—It is stated that bids will be received until July 1 by H. A. Stout, Archt., 600 Bartlett Bldg., for erecting a 3-story convention hall, 150x300 ft., for the Hall Co.; probable cost, $500,000.

Atlantic City, N. J.—Price & McLanahan, of Philadelphia, Pa., it is reported, have completed plans for a $750,000 hotel which is to be erected at Clark Pl. and Ohio Ave. by the Annex Hotel Co.

New York, N. Y.—Plans have been filed for an 8-story fireproof office building which is to be erected at 58 Cedar St. for Harvey Fisk & Sons at a cost of $140,000. Clinton & Russell, 32 Nassau St., are the archts.

Rochester, N. Y.—It is reported that the Rochester Carting Co. has secured a site and intends erecting a $100,000 warehouse.

Winston-Salem, N. C.—Articles of incorporation have been filed by the Forsyth Hotel Co., with a capital of $200,000, for the purpose of erecting a hotel here to cost about $100,000.

Youngstown, O.—Owsley & Boucherle, Wick Bank Bldg., it is stated, are preparing plans for a 3-story brick 40x315-ft. warehouse which is to be erected by the Morris Hardware Co. on E. Commerce St. at a cost of $60,000.

Elyria, O.—W. A. Ely is reported interested in the erection of a $100,000 arcade which is to be erected in this city.

Columbus, O.—Stribling & Lum, it is reported, have prepared plans for a 7-story business building to be erected at High and Chestnut Sts. for David Beggs.

Tiffin, O.—The Junior Order of United American Mechanics is reported to be considering the erection of a building this summer to cost about $20,000. Dr. H. L. Wenner, Pres. Bldg. Com.

Cleveland, O.—Max Faetkenheuer, mgr. of the Euclid Ave. Garden Theater, it is reported, is interested in the project of erecting a hippodrome in this city at a cost of about $2,000,000.

Pittsburg, Pa.—It is reported that on June 2 fire destroyed the American Theater completely and partially destroyed the Grand Opera House. Harry Davis, lessee of both buildings.

Jas. Wherry & Co., 857 North Ave., it is reported, have secured the contract to erect an 8-story warehouse for R. H. Boggs at a cost of $275,000.

**Philadelphia, Pa.*—A building permit has been granted to Thos. Little & Son, 1222 Clover St., to erect a 2-story granite parish house at Huntington and B Sts. at a cost of $31,000; also to A. L. Thomas, owner, E. Columbia Ave. and Allen St., to erect a 1-story brick storage house at Beach and Marlborough Sts. at a cost of $25,000.

The Hamilton Trust Co. (Crosby Fairlamb, Pres.), it is stated, has purchased a site at 40th and Market Sts., and intends erecting a bank building, for which plans have been prepared by Horace Trumbauer, Land Title Bldg. The building is to be of granite, brick and concrete, of fireproof construction, 71x75 ft., and is to cost about $250,000. It is stated that bids for its construction will soon be asked.

It is stated that a building permit has been issued to Brockie & Hastings, Archts., 328 Chestnut St., for additions to the Germantown Trust Co.'s Bldg., at Germantown and Chelten Aves., the cost to be about $25,000.

West Chester, Pa.—The Sharples Separator Co proposes erecting a building 225x65 ft. for storage and warehouse purposes only, and it will not be equipped with any power plant.

Homestead, Pa.—Chas. Jones is having plans prepared for the erection of a 3-story store and apartment building at 5th St., to cost $20,000.

Knoxville, Tenn.—All bids opened June 1 for erecting a 10-story building for the Mechanics' Natl. Bank have been rejected; according to reports the probable cost was to have been $200,000. Architects, Morgan & Dillon, Atlanta, Ga. E. G. Oates, cashier.

Plans are being prepared for a 4-story building which is to be erected for the Cumberland Club at a cost of $35,000.

Memphis, Tenn.—Shaw & Pfeil, Planters' Bldg., it is stated, have completed plans for the country club which is to be erected near Buntyn Station and is to cost $25,000.

Plans are being prepared by Shaw & Pfeil, Planters' Bldg., for a 14-story building which is to be erected for the Boyd Co. at a cost of about $250,000.

It is reported that plans have been completed by Shaw & Pfeil, Planters' Bldg., for a warehouse which is to be erected at a cost of $30,000 for Shanks, Phillips & Co.

Nashville, Tenn.—It is stated that plans are being prepared for erecting an annex to the hotel on Broad St., owned by Wm. Hartman, the cost, including furniture, to be about $25,000.

**Corsicana, Tex.*—The Bd. of Trus. of the Odd Fellows' Widows and Orphans' Home, it is stated, have awarded the contract to erect the dormitory and dining-room at the home (bids received June 1), to D. W. Brillhart. of Abilene, at a total of $34,291.

Ft. Worth, Tex.—It is stated that 2 buildings are to be erected at the Masonic Widows and Orphans' Home at a total cost of $24,000.

Dallas, Tex.—Press reports state that bids will be received until June 14 for erecting the 5-story brick and stone M. P. Exline Bldgs. at Commerce and Poydras Sts. Sanguinet & Staats, Archts., Main and Field Sts.

Wenatchee, Wash.—O. E. Loving and M. R. McMahon, of Wenatchee, it is reported, are planning to erect a $50,000 sanitarium at Soop Lake, Chelan County.

**Aberdeen, Wash.*—It is reported that N. Wrightman has secured the contract to erect the Masonic Temple at a cost of $17,800.

Seattle, Wash.—A. Warren Gould, Boston, Mass., it is stated. is preparing plans for an 8-story building to be erected for the furniture business at 2d Ave. and Pine St. at a probable cost of $150,000.

Spokane, Wash.—L. L. Rand, 517 "The Rookery," is preparing plans for a 2-story addition to a brick building owned by T. Fisher & Son; cost about $12,000.

Milwaukee, Wis.—C. D. Crane, 91 Wisconsin St., it is stated, has completed plans for a 6-story building which is to be erected for Joy Bros. on E. Water St. at a cost of $100,000.

It is reported that the Exposition Bldg. was destroyed by fire on June 4.

The erection of a $400,000 convention hall is reported under consideration.

Antigo, Wis.—It is reported that the Bohemian Society, Rad Zlata Syoboda, No. 47, is planning to erect an opera house at a cost of $30,000. Jos. Stengl is among the incorporators.

Wausau, Wis.—Philip Dean, of Merrill, it is reported, is planning to erect a $25,000 addition to Hotel Badger.

**Superior, Wis.*—David P. Wood, of Duluth, Minn., it is stated, has secured the contract to erect the union station here at about $50,000.

Green Bay, Wis.—The Odd Fellows, it is stated, have decided to erect an addition to the Odd Fellows Benevolent Home in this city, the cost to be about $15,000. J. L. Jorgenson, of Green Bay, may be able to give further information.

NEW YORK, N. Y.

130 W 17th St, 6-story br and stone loft bldg; c, $80,000; o, Middleboro Realty Co; a, E Wilbur.

3 Park Row, 8-story br and stone store and office bldg; c, $80,000; o, Park Row Realty Co; a, Robertson & Potter.

524 W 57th St, 6-story br and stone model creamery; c, $200,000; o, Sheffield Farms, Slawson-Decker Co; a, Frank A Rooke.

70th St and 1st Ave, 2 6-story br and stone stores and tenemts; total c, $60,000; o, Abraham D Weinstein; a, Horenburger & Straub.

109th St and Madison Ave, 6-story br and stone store and tenemt; c, $45,000; o, Chas J Weinstein; a, Geo F Pelham.

204 E 109th St, 2 6-story br and stone stores and tenemts; total c, $60,000; o, Abraham D Weinstein; a, Horenburger & Straub.

212 E 119th St, 2 6-story br and stone stores and tenemts; total c, $60,000; o, Jos Ruff; a, Horenburger & Straub.

Ave A and 70th St, 7 6-story br and stone tenemts; total c, $275,000; o, M J Bernstein; a, Bernstein & Bernstein.

Bway and 125th St, 6 6-story br and stone stores and tenemts; total c, $270,000; o, Emanuel Doctor; a, John Hauser.

Bway and 121st St, 6-story br and stone store and tenemt; c, $160,000; o, A C & H M Hall Realty Co; a, Neville & Bagge.

145th St and Bway, 2 6-story br and stone stores and tenemts; total c, $130,000; o, Martha B Mosher; a, Geo F Pelham.

**Items marked thus give the names of parties awarded contracts.*

St Nicholas Ave and 183d St, 2 3-story br and stone stores and dwells; total c, $20,000; o, Duff & Conger; a, Turner & Killian.

CHURCHES AND DWELLINGS.

Notes Arranged Alphabetically by States.

San Francisco, Cal.—It is reported that the members of the Park Congregational Church are contemplating the erection of an edifice at a cost of $15,000. Rev. J. H. Cooper, pastor.

Plano, Ill.—It is reported that bids will be received until June 14 by the Bldg. Com., 1st M. E. Church (J. P. Davies, Chmn.), for erecting an edifice.

Chicago, Ill.—C. Frank Jobson, Pullman Bldg., is preparing plans for a residence which is to be built on Astor St. and North Ave. for Rensselaer R. Cox. It will be 3 stories high, 40x90 ft., of pressed brick and terra cotta, and cost $40,000.

Chas. F. Sorenson, 648 N. Claremont Ave., is preparing plans for a church to be erected at Hill St. and California Ave. for St. Paul's English Evangelical Lutheran congregation, the Rev. L. Harrisville pastor. The building is to be a stone structure, with slate roof, 75x135 ft., and cost $40,000.

It is reported that the congregation of the R. C. Church of St. Josaphat (Rev. Father Lange, Pastor) is contemplating the erection of a stone edifice at W. Superior and Bickerdike Sts. at a cost of $100,000.

Lafayette, Ind.—The members of the German Evangelical Church, it is stated, intend erecting an edifice at 11th and Elizabeth Sts., at a cost of $20,000.

East Des Moines, Ia.—It is reported that the Church of the Visitation is to be improved at a cost of $30,000. J. F. Nugent, pastor.

New Orleans, La.—It is stated that improvements are to be made to the Rayne Memorial Church at St. Charles Ave. and General Taylor St., at a cost of about $20,000.

Minneapolis, Minn.—H. E. Edmonds will erect a 4-story brick apartment at 1913 Hennepin Ave., to cost $25,000. H. A. M. Robertson will erect a 2-story brick dwelling at 1820 S. Dupont Ave., to cost $15,000.

St. Paul, Minn.—The members of the Woodland Park Baptist Church, it is stated, intend erecting a new edifice at a cost of about $35,000.

**Greenville, Miss.*—Chas. Pearce, it is stated, has received the contract to erect the synagogue (bids for which were received May 22), at about $25,000.

Newark, N. J.—E. M. Waldron & Co., Cabinet and S. 6th Sts., it is stated, have received the general contract to erect an apartment house at 667 High St. for the estate of Chas. Froelich. It is to be a 4-story brick and stone structure, 45x100 ft., and is to cost about $40,000.

New York, N. Y.—Plans have been filed for a 5-story and basement granite and limestone dwelling, to be erected at 17 E. 51st St., for Frank K. Sturgis, at an estimated cost of $150,000. Ogden Codman, 569 5th Ave., is the Archt.

Newbern, N. C.—It is reproted that the members of the First Baptist Church are to spend about $18,000 in improvements. Address Pastor.

Columbus, O.—Dr. Washington Gladden, it is stated, is interested in the project to erect model tenements in this city at a cost of about $300,000.

Cincinnati, O.—It is reported that the members of the St. Francis Church are preparing to erect a $60,000 edifice.

Oberlin, O.—Reports state that a memorial chapel is to be erected for the Congregational Church in this city by Fredk. N. Finney, of St. Louis, Mo., at an estimated cost of $100,000.

**Marietta, O.*—Dickison, Bardsley & Foreman, it is reported, have received the contract to erect an edifice for the Congregational Church at a cost of $31,000.

Avalon, Pa.—The Bldg. Com. of the Avalon United Presbyterian Church, it is stated, has accepted the plans of J. C. Fulton, of Uniontown, for the new stone edifice which they propose erecting at a cost of $25,000.

Philadelphia, Pa.—The West York St. M. E. Church, it is reported, has decided to erect an edifice at a cost of $30,000. Rev. S. M. Vernon, Pastor.

A building permit has been granted to Geo. C. Dietrich, to erect a 1-story granite church at 1329 Erie Ave., for the St. Luke's Methodist Episcopal Church, at a cost of $25,000.

*A building permit has been granted to H. M. Zane, 1318 Chestnut St., to erect a 3-story brick and stone dwellg. at Princeton Ave. and Hegeman St. to cost $20,000; also to Melody & Keating, 1218 Chestnut St., to erect a 4-story addition to seminary and chapel at Chelten Ave. and Musgrave St. at a cost of $47,826.

The Bldg. Com. of Beth Israel Congregation, it is stated, will shortly authorize plans to be prepared for a new synagogue to be erected at 32d St. and Montgomery Ave. which is to cost about $50,000.

A building permit has been granted to Jacob Myers & Sons, Witherspoon Bldg., to erect a 5-story dwelling for L. W. H. Geise, at 21st and Delancy Sts., at a cost of $40,000.

St. Marys, Pa.—The congregation of the Sacred Heart R. C. Church, it is reported, is preparing to erect a $30,000 edifice. Rev. Paulinus Wenkman, pastor.

Superior, Wis.—The erection of a cathedral for the R. C. Church of this diocese, it is reported, is under consideration. Probable cost, $100,000.

La Crosse, Wis.—Jas. Stormont, 1426 Ferry St., it is reported, has received the contract for erecting a residence for Henry Gund at 15th and King Sts., at a cost of $40,000.

Milwaukee, Wis.—Plans are being prepared for an edifice which is to be erected by the members of the Church of the Epiphany and is to be of stone, 2 stories high, and to cost $25,000.

Toronto, Ont.—The Redemptorist Fathers will erect a church on McCaul St. to cost $90,000.

New York, N. Y.

119 Elizabeth St, 6-story br and stone tenemt; c, $27,500; o, C W Smith estate; a, Chas M Sutton.

66th St and Ave A, 10 6-story br and stone tenemts; total c, $400.000; o, Saml Mandel; a, Rouse & Sloan.

426 E 79th St, 6-story br and stone tenemt; c, $32,000; o, Glantz Realty & Constr Co; a, Maximilian Zipkes.

158 E 114th St, 3 6-story br and stone tenemts; total c, $120,000; o, Binder & Baum.

Madison Ave and 109th St, 2 6-story br and stone tenemts; total c, $108,000; o, Chas J Weinstein; a, Geo F Pelham.

2d Ave and 66th St, 5 6-story br and stone tenemts; total c, $195,000; o, Libman, Horowitz & Libman.

127th St and Lenox Ave, 6-story br and stone tenemt; c, $25,000; o, Mayer Hoffman; a, Lorenz F J Weiher.

129th St and Lenox Ave, 2 6-story br and stone tenemts; total c, $90,000; o, Weinstein & Lurie; a, Geo F. Pelham.

138th St and Lenox Ave, 6-story br and stone tenemt; c, $42,000; o, Meyer Frank; a, Geo. F. Pelham.

139th St and Bway, 2 5-story br and stone tenemts; total c, $100,000; o, Chas and Israel Axelroad and A Edelman; a, John Hauser.

139th St and Lenox Ave, 6-story br and stone tenemt; c, $42,000; o, Meyer Frank; a, Geo F Pelham.

140th St and Amsterdam Ave, 7 4-story br and stone dwells; total c, $105,000; o, G L Lawrence; a, Neville & Bagge.

152d St and Amsterdam Ave, 3 5-story br and stone tenemts; total c, $135,000; o, Nevins & Perelman.

Wilkins Pl and 170th St, 5 5-story br tenemts; total c, $210,000; o, Fleischman Realty Co; a, Geo F Pelham.

Crimins Ave and St. Mary's St, 3 5-story br tenemts; total c, $36,000; o, J K McAfee; a, M J Garvin.

Forest Ave and 161st St, 2 6-story br tenemts; total c, $85,000; o, Mary Scaefer; a, Harry T Howell.

Fulton Ave and 175th St, 5 5-story br tenemts; total c, $175,000; o, H Lavelle and G H Hill; a, J H Lavelle.

Trinity Ave and 165th St, 3 5-story br tenemts; total c, $150,000; o, Richard Dudensing; a, L F J Weiher.

51st St and 5th Ave, 2-story br and stone extension to 4-story br and stone residence; c, $55,000; o, Wm P Clyde; a, C P H Gilbert.

SCHOOLS.

Notes Arranged Alphabetically by States.

Harrisburg, Ark.—It is stated that bids will be received until June 17 by the Bd. Dirs. Special School Dist. (J. B. Estes, Secy.) for $15,000 school bonds.

Halfmoon Bay, Cal.—The Trus. of the Halfmoon Bay School Dist., it is stated, have decided to issue $20,000 bonds for erecting and furnishing a school.

Los Angeles, Cal.—Bids will be received June 27 by the Bd. Trus. State Normal School (John Wasson, Pres.) for furnishing materials and installing the ventilating and heating plant at the State Normal School; also for making repairs to said building. Morgan & Walls, archts., 232 N. Main St.

Hartford, Conn.—The Bldg. Com. of the South School Dist,, it is stated, has accepted the plans of Davis & Brooke, 49 Pearl St., for a 2-story brick addition to be erected to the new Park Ave. School, and those of E. B. Maynard, of Boston, Mass., for a 3-story brick addition to the Lawrence St. School.

Arcadia, Fla.—See "Water."

Tampa, Fla.—Barber & Kluttz, of Knoxville, Tenn., it is stated, are preparing plans for a 16-room high school to be erected in this city. A mechanical warm-air ventilating and heating system is to be installed.

Albany, Ga.—The citizens of the city of Albany and the county of Dougherty, it is stated, have voted in favor of erecting a high school to become a part of the city school system, the cost to be about $25,000.

Chicago, Ill.—The Bd. of Educ. is reported to be considering the erection of a home for the accommodation of all its departments, a commercial high school and assembly hall for teachers, on property belonging to the Bd. on W. Monroe St.

Bids will be received June 16 by the Chmn. Com. on Bldgs. and Grounds, Bd. Educ., Rm. 730, Tribune Bldg., for alterations, additions and repairs to plumbing, gas fitting and sewerage in various schools; separate bids will be received same date for alterations, additions and repairs to steam heating apparatus in various schools.

Chicago, Ill.—The Christ German Evangelical Lutheran congregation (the Rev. E. Werfelmann, Pastor) is contemplating the erection of a parochial building to contain school rooms and club facilities for young men at Humboldt St. and McLean Ave.; cost, about $30,000.

Pontiac, Ill.—It is reported that the School Bd. proposes erecting a $20,000 addition to the high school.

Ft. Wayne, Ind.—F. F. Allen, 258 W. Creighton Ave., it is stated, is preparing plans for the Jefferson School which it is proposed erecting at a probable cost of $45,000.

Logansport, Ind.—Frank Medland, it is stated, has received the contract to erect the North Side School at $12,000.

Waldron, ,Ind.—It is reported that bids will be received until June 21 by Jos. Byer, Trus. Liberty Township, for installing a steam heating and ventilating plant in the school at Waldron.

Petersburg, Ind.—Mrs. Emily Thornton, it is stated, has bequeathed to this town $50,000 for the erection of a school.

**Duncan, Ind. Ter.*—J. S. Moad, of Dallas, Tex., it is reported, has received the contract to erect the 3-story high school at $13,500.

Waterloo, Ia.—The Bd. of Educ. of the Independent Dist. of East Waterloo, it is stated, is offering for sale $25,000 school bonds.

Larned, Kan.—It is stated that the citizens are to vote on the question of issuing $20,000 bonds for the erection of a school.

Elkton, Ky.—It is stated that bids will be received until June 15 by the Bldg. Com. of the Vanderbile Training School, at Elkton, for erecting a 4-story dormitory, 64x40 ft. Jas. L. Long, Archt., Hopkinsville, Ky.

Johnsburg, Minn.—It is stated that bids will be receeived until June 15 by Stephen Klaaprich, Chmn. Bldg. Com., Adams, Minn., for erecting a parochial school at Johnsburg. W. F. Keefe, Archt., Austin, Minn.

**Springfield, Mass.*—The following are reported to be the bids received by the City Property Com. for the erection of a school on Howard St.: Jerry Shea & Son, 16 Columbia Terrace, $38,930 (awarded contract); J. F. Walls & Co., $41,368; O. A. Lariviere, $40,245; W. H. Falvey, $39,591; L. H. Scott & Co., $39,000.

Fall River, Mass.—The following are the bids opened May 15 for erecting a 9-room school for St. Joseph Parish (architects, L. G. Destremps & Sons, 56 Main St.), bidders of Fall River unless otherwise mentioned:

*Construction: James A. Donnelly, $30,998; Beattie & Cornell, $33,484; John Crowe, $32,879; J. A. Marcoux, $32,165; F. R. Quarry Constr. Co., $29,345 (awarded contract); J. A. Hughes, $33,500; Patk. Corrigan, $35,050; Keeler & Smith, Newport, $30,881; M. A. McCormick, Newport, $34,425.

a Heating, *b* plumbing: Stetson & Lord, *a* $3,605; W. A. & J. F. Whalen, *a* $3,819; Wm. Kennedy, *a* $3,525, *b* $1,618 (awarded contract); Henri Lagasse, *a* $3,496, *b* $1,635; J. H. Gildard, *a* $3,940; J. F. Johnston & Co., *a* $3,467 (awarded contract), *b* $1,699.

Plymouth, Mass.—The question of erecting a high school and a grammar school is reported under consideration.

Springfield, Mass.—Certain archts. have been requested to submit plans by July 5 to the Co. Comrs. for a building to be erected for the use of the Registry of Deeds and for the Probate Court. The cost of the building, including grounds, it is reported, is to be about $200,000.

Norway, Mich.—Charlton & Kuenzli, of Marquette, it is reported, have completed plans for a brick school which it is proposed erecting here at a cost of $40,000. It is stated that bids are now being received for the construction of same.

Wyandotte, Mich.—It is stated that a school is to be erected for the St. Patrick's R. C. Church at a cost of about $35,000.

Detroit, Mich.—The House has passed a bill authorizing the Township of Hamtramck in Wayne County to issue $15,000 bonds for school purposes.

Agricultural College, Mich.—Bids will be received until June 28 by the State Bd. of Agriculture (A. M. Brown, Secy.) for erecting a brick dormitory at the State Agricultural College. E. A. Bowd, Archt., Lansing.

**Fairfax, Minn.*—It is reported that the following are the contracts awarded for erecting a school here: General constr., Emil M. Johnson, Minneapolis, $23,859; ventilating and heating, Cuddy & Kavanaugh, New Ulm, $3,943; plumbing, Cuddy & Kavanaugh, $930.

St. Paul, Minn.—The following are reported to be the bids received May 31 for erection, etc., for the Jas. J. Hill School:

*Construction—E. J. Daly, $31,906 (awarded contract); C. Ash & Co., $34,300; Cameron & Co., $34,650; Olaf Swenson, $34,774; F. C. Norlander, $35,675; Newman & Hoy, $35,675; C. N. Levine, $36,571; St. Paul Bldg. Co., $36.883; J. H. Donahue, $37,500; Clarence P. Smith & Co., $39,685. These bids were on the basis of Twin City brick, with minor changes for Menominee brick and different kinds of interior finishing.

Plumbing.—Allan Black Co., $6,195; Hurley & Co., $6,393; M. J. O'Neil, $6,430; Dwyer Heating & Plumbing Co., $6,585; McQuillan Bros., $6,748.

*Heating.—Geo. M. McGreary, 156 E. 3d St., $3,745 (awarded contract); Dwyer Heating & Plumbing Co., $3,886; Hanke & Eha, $3,898; Davis & Sons, $3,910; Hurley & Co., $4,153; Roberts-Goss Co., $4,398; Knapp, Signs & Co., $4,449; Allan Black Co., $4,775.

Bids on plumbing were rejected and new bids are to be received.

*Bids received at same time for heating plant in Rice School and Sibley School are reported to have been awarded to Holt & Dahlby, 820 Payne Ave., at $3,818 and $4,263 respectively.

South St. Paul, Minn.—The following are reported to be the bids received by the School Bd. on May 29 for erecting a school: James Pervis, Minneapolis, $43,698; Martin Johnson, Presco, Ia., $37,300; J. B. Nelson & Co., Mankato, $41,000; A. Nash & Co., St. Paul, $37,966; J. K. Nolan, South St. Paul, $43,560; Timothy Reardon, St. Paul, $46,000.

Bids were also received for plumbing of said building, but they exceeded the appropriation.

**Redwood Falls, Minn.*—J. B. Nelsen & Co., of Mankato, it is reported, have received the contract to erect the high school at $13,394.

**Dillon, Mont.*—A. L. Stone, Secy. Executive Bd., State Normal College, writes that the contract for erecting a main building for the State Normal College here (bids opened May 27) has been awarded to Edw. Wagner, of Helena, for $44,985.

**Henderson, N. C.*—D. K. Cecil & Co., it is reported, have received the contract to erect a school at $20,000.

Concord, N. H.—The Union School Dist. is stated to have voted to erect a high school to cost $90,000, and a school at West Concord, to cost $28,000. No architect selected as yet. Chas. R. Corning, Chmn. Bldg. Com.

Jersey City, N. J.—Henry Snyder, Supt. of Schools, writes that it is proposed to erect several schools at a total cost of about $218,000. T. T. Rowland, Jr., Superv. Archt. of Schools.

It is stated that bids will be received June 22 by the Bd. of Educ. for alterations to School No. 6, Central and St. Paul Aves.

Union, N. J.—Bids will be received until June 19 by the Bd. of Educ. (Albert C. Eppinger, Chmn.) for completing the unfinished parts of No. 3 School.

Atlantic City, N. J.—The Bd. of Educ., it is stated, has accepted the plans of S. Hudson Vaughn, of Atlantic City, for the school to be erected at Texas and Monterey Aves., in the 4th Ward. It is reported that bids for the construction are soon to be asked and the cost is not to exceed $40,000.

Montclair, N. J.—Bids will be received until June 27 by the Bd. Educ. for erecting the Hillside Ave. School according to plans prepared by McKim, Mead & White, of New York, N. Y., as advertised in The Engineering Record.

**Newark, N. J.*—Contracts have been awarded as follows for the erection of the Belmont Ave. School, the total amounting to about $129,739 (bidders all of Newark). American Concrete-Steel Co., masonry, $69,000, and iron work, $15,400 Wm. G. Sharwell & Co., carpenter work, $17,469; roofing and metal work, Baier & Conrad, $6,590; plumbing, Jaehnig & Peoples, $6,693; electrical work, Wm. Browe's Son Co., $3,491; steam heating, Shay & Robinson, $7.789; air-moving apparatus, Electric Motor & Equipment Co., $1,475.

Bids will be received June 20 by the Com. on School Houses, Bd. Educ. (R. O. Argue, Secy.) for furnishing materials and erecting Avon Ave. School; separate bids to be submitted on mason, iron, carpenter, plumbing, steam

Items marked thus give the names of parties awarded contracts.

heating, electrical, roofing and metal work, and air moving apparatus.

New York, N. Y.— C. B. J. Snyder, of the Dept. of Educ., it is stated, has filed plans for a 5-story school, to be erected 350 ft. west of 7th Ave., between 147th and 148th Sts., of brick trimmed with limestone and terra cotta, to cost about $275,000. It is to be known as Manhattan Pub. School No. 90.

**Brooklyn, N. Y.*—The following are the bids opened June 5 by C. B. J. Snyder, Supt. School Bldgs., N. Y. City, for the general construction of additions to and alterations in school 89, Brooklyn Boro.: Richard E. Heningham, $129,478; Geo. Hildebrand, 1004 Bway., N. Y. City, $123,300 (awarded contract); Chas. H. Peckworth, $128,465; Wm. Werner, $131,840; Thos. Cockerill & Son, $138,900, and Clarke & Stowe, $136,000.

Long Island City, L. I., N. Y.—Bids will be received June 26 by C. B. J. Snyder, Supt. School Bldgs., New York City, for alterations, repairs, etc., to 20 schools, all in Boro. Queens.

Jamaica, L. I., N. Y.—Bids will be received until June 19 by C. B. J. Snyder, Supt. School Bldgs., New York City, for the sanitary work and gasfitting in School 82, Jamaica.

Hempstead, L. I., N. Y.—The citizens have voted in favor of issuing $55,000 bonds for the purchase of a site and the erection of a brick school.

West New Brighton, S. I., N. Y.—See "Power Plants, Gas and Electricity."

New Brighton, S. I., N. Y.—Bids will be received by C. B. J. Snyder, Supt. School Bldgs., New York City, until June 19 for erecting fire-escapes and making alterations at Schools 8, 9, 13, 19 and 22; also for alterations, repairs, etc., to 12 schools, all in Boro. Richmond.

Buffalo, N. Y.—Bids will be received June 16 by the Dept. Pub. Wks. (Francis G. Ward, Comr.) for putting new steel ceilings throughout 1st and 2d floors of Schools 18, 32 and 36.

**Middletown, N. Y.*—It is reported that the contract for erecting a school on Mulberry St. has been awarded as follows: Carpenter work, Edwin McWilliams, 23 John St., $8,475; mason work, Mitchell & Stever, $12,599; heating and plumbing, Geo. A. Swalm, Son & Co., 18 North St., $4,950; total, $26,024.

**Carthage, N. Y.*—It is stated that the contract to erect the school in W. Carthage has been secured by F. A. Caswell, of Watertown, at $24,994.

Raleigh, N. C.—The erection of a high school is reported under consideration.

Columbus, O.—The Dominican Fathers, it is reported, intend erecting a high school, residence and a college at Washington, 11th and Mt. Vernon Aves. The high school and residence will be erected this year and the college next year.

Crestline, O.—The School Bd. is said to be considering the erection of a school at a cost of $25,000.

Massillon, O.—The erection of an addition to the State St. school is reported under consideration, $27,000 bonds having been sold for that purpose.

Cleveland Heights, O.—Bids will be received July 6 by the Bd. Educ., Village School Dist. (Wm. G. Phare, Clk., 402 Am. Trust Bldg., Cleveland) for furnishing materials and erecting a 4-room brick school on Roxboro Road; Geo. F. Hammond, Archt., 166 Euclid Ave., Cleveland.

Rawson, O.—The citizens have voted in favor of issuing $15,000 bonds to erect a school.

Providence, R. I.—The Bd. of Aldermen has passed a bill appropriating $150,000 for the erection of an addition to the Technical High School and has approved the plans of Martin & Hall, Union Trust Bldg., for the improvement. The addition alone is to cost about $124,000.

**Brownwood, Tenn.*—Jos. Chriskey & Son, it is reported, have secured the contract to erect the high school at $16,500.

Nashville, Tenn.—The Special Com. of the City Council, it is stated, has decided to recommend the passage of the bill appropriating $300,000 for the erection of a high school. The question of issuing bonds to this amount is to be submitted to a vote of the people.

San Angelo, Tex.—Oscar Ruffini, of San Angelo, it is stated, has prepared plans for a central high school which it is proposed erecting at a cost of about $20,000. Wm. S. Kelly is Chmn. Bd. Trus.

Dallas, Tex.—See "Power Plants, Gas and Electricity."

Detroit, Tex.—It is stated that bids will be received until June 15 by the Bd. School Trus. (W. E. Holloway, Secy.) for $20,000 school bonds.

**Salt Lake City, Utah.*—The Bd. of Regents of the State Univ. is stated to have awarded contracts as follows: For gymnasium, to T. J. Armstrong, $19,990; extension to physical building, O. Hodgson, $14,100, and for shops to O. Chytraus, $6,700. Contractors all of Salt Lake City.

Fairmont, W. Va.—It is stated that bids will be received until June 20 by the Bd. Educ. (T. W. Boydston, Secy.) for $100,000 refunding and school bonds.

Peshtigo, Wis.—The School Bd. is reported to be considering plans for the erection of a high school.

**Ashland, Wis.*—Contracts, it is reported, have been awarded as follows for erecting a school, bids for which were opened on May 22 (bidders all of Ashland). General construction, A. Donald & Son, $32,299; heating, Wm. Neuman & Co., $13,794; plumbing, Fred Perrin, $2,695; electric wiring, Fred. Perrin, $680; and gas piping, Wm. Upthegrove, $307.

Appleton, Wis.—Plans have been prepared by Van Ryn & De Gelleke, of Milwaukee, for the Carnegie Library which is to be erected at Lawrence Univ., at a cost of $50,000.

Milwaukee, Wis.—Bids will be received June 23 by the Bd. Pub. Wks. (Chas. J. Poetsch, Chmn.) for furnishing materials and erecting the North Division high school at Center and 11th Sts.; separate bids to be submitted on masonry, cut stone, electrical, carpenter, galvanized iron, tar and slate roof work, cast wrought iron and steel work, ventilating and heating, fireproof floors, etc.

It is reported that $120,000 bonds are to be sold by the city, $90,000 to be used for the erection of a school in the 22d Ward and $30,000 for fire-escapes on various buildings.

Blanchardville, Wis.—Van Ryn & DeGellecke, of Milwaukee, it is stated, have prepared plans for a school to be erected here. It is to be of brick with stone trimmings, 2 stories high, and cost about $30,000.

Winnipeg, Man.—Bids will be received June 17, by R. Rogers, Minister Pub. Wks., for a principal's residence, dairy, science bldg. and power house, to be erected on the Agricultural College grounds. S. Hooper, Archt., Parliament Bldgs.

STREET CLEANING AND GARBAGE DISPOSAL.

Notes Arranged Alphabetically by States.

**Orange, N. J.*—The contract for scavenger work for 3 yrs. is stated to have been awarded to Frank A. Moloney at $11,000 per yr.

Tacoma, Wash.—The City Council has appropriated $4,500 to be used for the purchase of 3 street-cleaning machines.

NEW INDUSTRIAL PLANTS.

See also Business Buildings.

S. Birkenstein & Sons, 48-52 Michigan St., Chicago, Ill., are erecting a building on Ontario St., and will install about 17 h.p. for elevators and 10 h.p. for miscellaneous purposes.

The American Box Ball Co., Indianapolis, Ind., of which J. I. Holcomb is vice-president, is erecting a 2-story, 60x180-ft. factory building, the upper floor of which will be occupied by the J. I. Holcomb Mfg. Co. It has not been decided whether electricity, gasoline or steam will be used to furnish power. It is expected to install a steam-heating plant for heating and dry kiln use, and the American Box Ball Co. will probably install wood-working machinery.

The Standard Sanitary Mfg. Co., Detroit, Mich., manufacturer of sanitary woodwork, contemplates building a new plant in the near future, but is not yet ready to give out details concerning the plant.

The C. C. Anderson Mfg. Co., Fostoria, O., manufacturer of muslin and flannellette undergarments, is erecting a 3-story, 80x100-ft. building. It is expected to install a 20-h.p. motor and lighting and power generating equipment.

The Durham-Pardue Mfg. Co., Gallatin, Tenn., is erecting a 30x40-ft. factory for making insulator pins and brackets. The company is in the market for a 25-h.p. boiler, 20-h.p. engine, insulator pin and bracket machinery, rip saws, cutoff saws, etc.

The Hoffman Heater Co., 424 Broadway, Lorain, O., is erecting a 40x100-ft. building and is in the market for a 16-h.p. gas engine.

The North & Judd Mfg. Co., New Britain, Conn., will erect a 5-story and basement, 50x156-ft. building. One floor will be used for a machine shop, the balance being used for storage.

The Cincinnati Rubber Mfg. Co., 1611 First National Bank Bldg., Cincinnati, O., is erecting a series of 2-story buildings, covering a ground area of 200x310 ft., and will install 800 h.p. in Stirling boilers and about 450 h.p. of engines in two units. A portion of the plant will be driven directly from a 300-h.p. engine, another part belted from a 150-h.p. engine, and the balance run by motor, the current being secured from a direct-connected, 75-kw. generator. W. G. Brown, vice-pres. and gen. mgr.

The American Biscuit Co., Crookston, Minn., has let contract for a 3-story, 50x85-ft. factory building, and is in the market for power equipment; the power will be electricity generated from water power. Adler C. Clausen, secy. and gen. mgr.

A correspondent writes that the Simonds Mfg. Co., Fitchburg, Mass., will erect a brick addition, to cost about $75,000, to its shop for making saws and machine knives.

A. A. McKay, Chicago, Ill., has had plans prepared for an 8-story, 84x155-ft. manufacturing building of mill construction to be erected at 264-270 Fifth Ave., at a cost of $150,000, according to local newspaper reports.

Wm. Steiner, Sons & Co., 116-122 East 14th St., New York, have bought a lot in the Bronx which measures 35,000 sq. ft. It has not yet been decided whether the factory to be erected will be three, four or five stories. About 250 h.p. will be required.

The New York Central Iron Works Co., Geneva, N. Y., contemplates erecting a new plant, but is not yet in position to give out details concerning same.

The Taunton, Mass., Knitting Co. will erect a 2-story, 200x50-ft. building. Electricity obtained from the municipal power plant will be used for power. Wm. Hurd, mgr.

The scythe forge shop and the grinding department for scythes of the North Wayne Tool Co., Hallowell, Me., were destroyed by fire. Water power of about 150 h.p. capacity was used. The forge shop, if rebuilt, will probably be about 140x40 ft., and the grinding and polishing building 2 stories 80x40 ft. Plans for rebuilding have not yet been matured.

The T. P. Howell Co., leather manufacturers, is to erect a 2-story, 70x120-ft. addition to its plant at New and Wilsey Sts., Newark, N. J., to be used as a japanning shop, according to local newspaper reports. Cost, $20,000. John B. Warren, archt.

A permit has been issued to the Abel & Bach Co., Milwaukee, Wis., which manufactures trunks, for a 6-story factory building at 10th and Clybourn Sts., to cost $150,000, according to local newspaper reports.

Harsh Bros. & Co., Nashville, Tenn., will erect a $10,000 grain elevator adjoining their present plant, according to local press reports.

The Reidy Foundry Co., Chicago, Ill., is erecting a new foundry, to cost $50,000, at North 47th Ave. and Cornelia St., according to local newspaper reports. W. L. Stebbins, archt.

The Murphy Heating Co., Detroit, Mich., will erect a 10-story cold-storage plant on a 150x120-ft. lot at Congress and Wayne Sts., according to local newspaper reports. Rogers & McFarland, archts.

Contract has been let by the Santa Fe System for a six-stall extension to the roundhouse and a railway machine shop at Silsbee, Tex., according to local newspaper reports. It is stated that the contract was let to C. W. Whitney, of Beaumont, and that the cost will be about $25,000.

The Dahlstrom Metallic Door Co., Jamestown, N. Y., contemplates the erection of a factory building, and is negotiating for the purchase of land.

The Minerva Mfg. Co., Toronto, Ont., has bought a site, measuring 270x113 ft., on which to erect a factory, according to local newspaper reports.

The Kennicott Water Softener Co., Chicago, Ill., has bought 7 acres of land at Chicago Heights, on which it will at once begin the erection of factory buildings, according to local newspaper reports.

It has been announced that the New York, New Haven & Hartford R. R. Co. will spend $1,000,000 on locomotive repair shops at Norwood, Mass., substantially duplicating the present large car repair shops at Readville.

Ground has been broken for a brewery to cost $600,000 for the Jackson Brewing Co., San Francisco, Cal., according to local newspaper reports.

Roydhouse, Arey & Co., Philadelphia, Pa., have been awarded contract for building additions to cost about $50,000 to the Pennsylvania Railroad's new shops at Milham Junction, near Trenton, according to local newspaper reports.

The Canada Tin Plate & Sheet Steel Co., Morrisburg, Ont., is about to construct a plant for the purpose of producing tin terne and Canada plate, fine sheets for electrical purposes and enameled ware. The plant will be operated by electricity, with steam as an auxiliary. The company is not at present prepared to give out detailed information regarding the plant.

Thomas Crow, Toronto, Ont., will erect a 3-story blacksmith shop and carriage factory, to cost $15,000; the Pease Furnace Co. will erect a factory building to cost $40,000, and the Toronto Gas & Gasoline Engine Co. will erect a concrete machine shop, to cost $17,000, according to local newspaper reports.

Dodge & Day, engineers and architects, Philadelphia, have been retained to make a thorough examination of the mechanical and electrical features of the plant of the Link-Belt Machinery Co., Chicago, with a view of planning a layout that will accomplish in the most economical and efficient manner the improvements desired by the management. It is probable that the power plant will be enlarged, considerable additional electrical equipment installed and some new tools bought.

It is announced that the Erie R. R. has made an appropriation of $1,500,000 for tools for the re-equipment of the repair shops along its lines and for building new roundhouses, turntables, etc. It is stated that nearly $500,000 is being expended in providing new iron-working tools, such as planers, lathes, steam hammers, cranes, etc.

Contracts for the construction of a large extension to the machine shops and the building of a large storage yard at Reading, Pa., for the Reading Ry. have been awarded to the Charles McCaul Co., Philadelphia, Pa., according to local newspaper reports. It is stated that the extension to the machine shop will consist of a one and two-story, 192x400-ft. steel and brick structure, with four 13x23-ft. washrooms. The storage yard will consist of a one-story, 67x540-ft. steel and brick building, enclosed at the ends with brick gables and open at both sides.

The Quaker City Shirt Mfg. Co., Norristown, Pa., will build a three-story and basement, 95x55-ft. addition to its factory.

MISCELLANEOUS.

Notes Arranged Alphabetically by States.

Montgomery, Ala.—Bids are wanted July 1 for dredging Link Channel, Apalachicola Bay, Fla., and Carrabelle Bar, Fla., as advertised in The Engineering Record.

Mobile, Ala.—Bids are wanted July 3 for building dam abutment and guard cribs at Lock No. 1, McGrews Shoals, Tombigbee River, Ala., as advertised in The Engineering Record.

The following are the bids opened May 31 by Maj. W. E. Craighill, Corps Engrs., U. S. A., for dredging in Pascagoula River and Mississippi Sound: *a* Sect. 1—Hydraulic process, place meas. *b* Sect. 2—Hydraulic process, place meas. *c* Sect. 2—Bucket or dipper process, scow meas. Geo. W. Catt, New York, N. Y., *a* 11.9 cts., *b* 12.5 cts., c 10 cts.; Mississippi Dredging Co., Mobile, Ala., *a* 11 cts.; Geo. G. Barker, Wilmington, Del., *c* 10 cts.; North American Dredging Co., San Francisco, Cal., *a* and *b*, 14.48 cts.; Chas. G. Ollinger, Mobile, Ala., *a* 13.5 cts.; John Andersen, Gulfport, Miss. (recommended for acceptance), *a* 10.25 cts., *b* 8 cts.; Bowers Southern Dredging Co., Galveston, Tex., *a* and *b*, 15.5 cts.; Southern Dredging Co., Mobile, Ala., *a* 9.98 cts.

Wilmington, Del.—Bids are wanted July 6 for repair and extension of jetty at mouth of Mispillion River, Del., as advertised in The Engineering Record.

The following are the bids opened June 5 by Capt. C. A. Flagler, Corps Engrs., U. S. A., for dredging in Smyrna River, Del., price given per cu. yd. (bidders of Philadelphia, Pa., unless otherwise mentioned): River and Harbor Improv. Co., 10 cts.; Edw. F. Fonder Co., 12⅞ cts.; American Dredging Co., 11.5 cts.; Wilmington Dredging Co., Wilmington, Del., 11.7 cts.; John L. Grim, 11⅜ cts.; Houston Rickards Dredging Co., 15 cts.

Washington, D. C.—Bids will be received until June 27 at the Bureau Supplies and Accounts, Navy Dept., Washington, for furnishing at the navy yards, Boston, Mass., New York, N. Y., League Island, Pa., Washington, D. C., and Norfolk, Va., a quantity of machine tools, etc., as follows: Electric hoist, steam locomotive wrecking car, 10-ton locomotive cranes, milling machine, etc. H. T. B. Harris, Paymaster Gen., U. S. N.

Bids will be received at the Bureau Supplies and Accounts, Navy Dept., until June 20 for furnishing at the navy yard, Washington, D. C., a quantity of naval supplies, including terra cotta tile and corrugated sheet iron. H. T. B. Harris, Paymaster Gen., U. S. N.

Jacksonville, Fla.—Bids are wanted July 1 for dredging and removal of rock in Hillsboro Bay, Fla., as advertised in The Engineering Record.

Indianapolis, Ind.—See "Railroads."

**Items marked thus give the names of parties awarded contracts.*

Boston, Mass.—The following are the bids opened June 1 by the Charles River Basin Comn. (Hiram A. Miller, Ch. Engr.) for the construction of the Boston marginal conduit, Sect. 2: (*a*) Jas. Driscoll & Son, Brookline; (*b*) The H. Gore Co., Boston; (*c*) Nawn & Brock, Boston; (*d*) Manufacturers' Contr. Co., Wilmington, Del.; (*e*) D. F. O'Connell Co., Boston; (*f*) Metropolitan Contr. Co., Boston; (*g*) Patk. McGovern, Boston; (*h*) Rowe & Perini, S. Framingham; (*i*) Lawler Bros., Charlestown; (*j*) Falvey & Kelly, Boston.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*
1,800 lin. ft. earth excavation and refill (main conduit)	$8.50	$11.66	$10.50	$12.00	$10.43	$11.85	$11.00	$14.00	$10.00	$18.75
175 lin. ft. earth excav. and refill (overflow chamber and conduit)	7.00	8.29	7.25	10.25	10.43	9.00	7.50	10.00	10.00	20.00
200 cu. yds. rock excavation	5.00	6.00	5.00	4.00	6.00	2.00	4.00	4.00	5.00	7.00
62,000 lin. ft. piles	.14	.15	.13	.14	.18	.15	.16	.17	.20	.15
2,000 lin. ft. underdrain	.75	.60	.62	.80	.61	.65	.60	.50	2.50	1.00
2,600 cu. yds. concrete masonry (except backing)	7.50	6.13	7.20	6.65	7.00	7.15	8.00	7.00	9.50	8.00
100 cu. yds. concrete masonry for backing	3.75	3.065	3.60	3.325	3.50	3.575	4.00	3.50	4.75	4.00
45 tons iron and other metal work	8.00	10.80	15.00	14.00	4.00	20.00	10.00	12.00	30.00	7.00
70 M. ft. sheeting left in place	18.00	22.00	35.00	20.00	20.00	16.00	30.00	20.00	65.00	25.00
200 cu. yds. earth excavation in trench below masonry and underdrain	1.50	.90	2.00	2.00	1.50	2.00	1.50	2.00	1.00	3.00
200 cu. yds. gravel refilling in trench below masonry and underdrain	1.50	1.80	1.50	1.50	1.50	1.75	1.50	2.00	2.00	2.00
Crossings of Fruit and Cambridge St. overflows (lump sum)	800.00	360.00	500.00	600.00	800.00	1500.00	400.00	820.00	2000.00	3000.00
Total	$50,600	$53,309	$53,874	$55,426	$55,709	$57,122	$57,782	$61,400	$71,825	$77,215

Prophetstown, Ill.—Bids will be received until June 29 by the Comrs. of the Union Special Drainage Dist. in the counties of Henry and Whiteside at the office of F. W. Sears, Engr., Prophetstown, for the enlargement and construction of the main ditch and one tributary in said drainage dist., requiring the removal of approximately 300,000 cu. yd. of material.

Monroe, La.—The Tensas Basin Levee Bd. is stated to have decided to top the levees in Chicot County, Ark., south of Sunnyside, instead of building a loop. Topping the levees will cost about $50,000.

**New Orleans, La.*—J. F. Coleman, Engr. Bd. Port Comrs., 920 Hibernia Bldg., writes that the Bedell Iron & Steel Co., of New Orleans, has secured the contract for erecting Julia St. steel shed No. 2 (bids opened May 30) for $8,404.

The following are the bids opened on May 30 by Capt. B. T. Clayton, Q. M., U. S. A., for constructing back levee and making fill for site for proposed port at Ft. Philip, about 50,000 cu. yd. (price given per cu. yd.): Elmer A. Florer and C. F. Thurston, 26¾ cts. (recommended for acceptance); Michael Cullen, 39.9 cts., and John F. McCoy, 37 cts.

Baltimore, Md.—Bids are wanted July 5 for dredging rivers and harbors on east shore of Chesapeake Bay, Md., as advertised in The Engineering Record.

**Boston, Mass.*—Col. W. S. Stanton, Corps. Engrs., U. S. A., writes that the following are the bids opened May 29 for excavation, etc., at Lovells Island, Mass.: (*a*) 27,600 cu. yds. excav. to ditch; (*b*) laying 875 lin. ft. vitr. sewer pipe (*c*) building 130 ft. manholes; (*d*) laying 975 ft. galv. iron pipe: J. B. O'Rourke, Dorchester, Mass., *a* 85 cts.; *b* 10 cts.; *c* $1.25; *d* 4 cts. Nicola Scioli, Cliff Side Park, N. J., *a* 75 cts.; *b* 40 cts.; *c* $2; *d* 10 cts. Cefalo & Ferguson, Boston, Mass., *a* 64 cts.; *b* 15 cts.; *c* $2; *d* 1.5 cts. Rowe & Perini, South Framingham, Mass. (awarded contract) *a* 39 cts. *b* 5 cts.; *c* $1; *d* 4 cts. C. E. Trumbull Co., Boston, Mass., *a* 49 cts.; *b* 12 cts.; *c* $3; *d* 5 cts. John Cashman, Quincy, Mass., *a* 70 cts.; *b* 20 cts.; *c* 80 cts.; *d* 10 cts.

Ft. Rodman, New Bedford, Mass.—Bids will be received until June 20 by Maj. John E. Baxter, Q. M., U. S. A., Boston, for furnishing materials and moving building No. 8 (old hospital) to a new site with construction of brick pier and curtain wall foundations, and for repair of building.

Grand Rapids, Mich.—Col. M. B. Adams, Corps Engrs., U. S. A., writes that the following are the bids opened June 2 for excavating channel from Kalamazoo River to Lake Michigan, approximate quantity 350,000 cu. yd. (price given per cu. yd.), *a* in scow or bins, *b* in spoil bank: Great Lakes Dredge & Dock Co., Chicago, Ill., *a* and *b*, 9½ cts. (recommended for acceptance); Burk, Smith & Nelson, Muskegon, *a* 11 cts., *b* 13 cts.; Northern Dredge Co., Duluth, Minn., *a* 14.6 cts., *b* 14.4 cts.; Saml. O. Dixon, Milwaukee, Wis., *a* 15 cts.; The Fitz Simons & Connell Co., Chicago, Ill., *a* and *b* 16 cts.; Lake Superior Contr. & Dredging Co., Duluth, Minn., *a* 15¾ cts., *b* 17 cts.; Buffalo Dredging Co., Buffalo, N. Y., *a* and *b*, 25 cts.

**Vicksburg, Miss.*—Contracts for levee work (bids opened May 31 by Capt. Geo. M. Hoffman, Corps Engrs., U. S. A.) are stated to have been awarded as follows: The work is for enlarging and topping and extends from Rosedale to Lake Washington, on the east bank, and from Chicora, Ark., to Bunch's Bend, on the west bank. J. K. Jeffries, of Memphis, secured the contract for 435,000 cu. yd. in Upper Yazoo District; John Scott & Sons, of St. Louis, 239,000 cu. yd. in Rosedale Dist.; Lawrence Bros., of Friars Point, 190,000 cu. yd. of topping at Arkansas City, and 25,000 of banquette work at Luna, Ark. Helgason Bros., of Vicksburg, secured the Opossumpoint enlargement, about 120,000 cu. yd., the balance being apportioned in smaller quantities among several bidders. The prices run from 17 cts. to 40 cts, per cu. yd., according to nature and location of the work.

Vicksburg, Miss.—Bids will be received until June 20 by the Bd. Comrs. of the 5th La. Levee Dist. at the office of the U. S. Engr., 108 W. Crawford St., Vicksburg, for the following levee work: Cabin Reele Enigt levee, Madison Parish, 35,000 cu. yd.; Evergreen-Bondurat levee, Tensas Parish, 20,000 cu. yd.; Cottage Home levee, Tensas Parish, 150,000 cu. yd.; Moro levee, Concordia Parish, 100,000 cu. yd., and Knox Point South levee, Concordia Parish, 100,000 cu. yd. Also same time and place the Bd. of Comrs. of the Tensas Basin Levee Dist. will receive bids for the following levee work in Arkansas: Vancluse and Sunnyside levee, 125,000 cu. yd.; Lake Port to Brooks Mill, Chicot County, 125,000 cu. yd.

New York, N. Y.—The Bd. of Estimate has appropriated $50,000 for a gateway at 7th Ave. and 110th St. and Central Park, to be part of the memorial to the late Andrew H. Green. The money is not to be available until the Memorial Com. has raised a like sum.

Bids will be received June 16 by the Dept. Docks and Ferries (Maurice Featherson, Comr.) for furnishing and delivering about 10,000 bbls. Portland cement in Boro. Manhattan.

Bids will be received by the Dept. Docks and Ferries (Maurice Featherson, Comr.) until June 19 (extension of date) for furnishing materials and constructing a pier near ft. of Cuyler's Alley, East River, to be known as Pier 8. Bids will also be received same date for constructing a pier at the ft. of Old Slip, to be known as Pier 10, East River.

Bids will be received June 20 by Nicholas J. Hayes, Fire Comr., for furnishing materials and erecting 2 freight elevators in the new repair shops, 56th St. and 12th Ave., Boro. Manhattan.

The Mayor has approved the ordinance providing for the issue of $40,000 bonds for improvements on Harts Island, including new brick trench, new steam pipes, etc., and new salt water fire lines.

Brooklyn, N. Y.—Bids will be received until June 15 by the Bd. Park Comrs. (John J. Pallas, Pres.), New York City, for furnishing and delivering Hudson River road gravel on parks and parkways in Boros. of Brooklyn and Queens.

Albany, N. Y.—Press reports state that the State Bd. of Pub. Wks. is making new surveys along the line of the barge canal and that contracts will probably soon be let for a section from Eagle Harbor to Medina, a distance of 7 miles.

Albany, N. Y.—The Governor has signed the bill providing for an appropriation of $200,000 for repair of existing mechanical structures and works connected with the canals.

**Columbus, O.*—Contracts for improving the northern division of Ohio and Erie Canal (bids opened May 31) have been awarded as follows: To King Bridge Co., Cleveland, for 3 aqueducts for $10,500; to A. Adamson, Akron, for 30,000 lb. wrought and steel for lock gates, 3½ cts. per lb., and to Atlantic Fdy. Co., Akron, for 30,000 lb. castings for locks, 2½ cts. per lb. Chas. E. Perkins, State Engr.

Cincinnati, O.—Bids will be received until June 30 by Lieut. Col. E. H. Ruffner, Corps Engrs., U. S. A. Cincinnati, for furnishing American Portland cement for use on ice piers in Ohio River, as follows: 1,362 bbls. at Gallipolis, O., and 1,560 bbls. at Maysville, Ky.

Cleveland O.—The Council has passed an ordinance providing for the improvement of the west end of Edgewater Park, at a cost of $18,000.

The lowest bid opened on May 31 by the Bd. of Pub. Service for dredging river from Upper C. T. & V. R. R. Bridge to the bridge of the W. & L. E. R. R. Co., requiring about 800,000 cu. yd., is stated to have been submitted by L. P. & J. A. Smith at 24 cts. per cu. yd.

The Bd. of Pub. Service (A. R. Callow, Secy.) is reported to have decided to reject all bids received May 31 for dredging and improving Cuyahoga River, all the bids received being too high. New bids will be received. About $80,000 will be expended on this work.

Pittsburg, Pa.—Bids are wanted July 3 for constructing 6 bear-trap gates in Ohio River, Pa., as advertised in The Engineering Record.

Norfolk, Va.—Bids are wanted July 3 for dredging and removing wreck in Norfolk Harbor, Va., as advertised in The Engineering Record.

Galveston, Tex.—The following are reported to be the bids opened May 13 by Capt. Edgar Jadwin, Corps Engrs., U. S. A., for a new dredge for this harbor: North American Dredging Co., San Francisco, Cal., $89,350; Geo. W. Catt, of New York, N. Y., $98,000; Bowers Southern Dredging Co., Galveston, $102,500, and Elliott Machinery Co., of Baltimore, Md., $111,400.

Port Wing, Wis.—The following are the bids opened June 5 by Maj. Chas. L. Potter, Corps Engrs., U. S. A., Duluth, Minn., for pier work at Port Wing: Whitney Bros. Co., Superior, $14,100; A. G. Osman & Co., Duluth, Minn., $17,397, and Powell & Mitchell, Marquette, Mich., $19,596.

**Milwaukee, Wis.*—The contract for improving harbor at Milwaukee (bids opened May 16) is stated to have been awarded to Wm. H. Gillen, of Milwaukee, for $111,000.

Toronto, Ont.—A deputation consisting of J. D. Allan, Pres. Toronto Bd. of Trade; Col. Q. I. Davidson and R. C. Steele, of Toronto, and H. C. Spalding, of New York, N. Y., is reported to be at Ottawa for the purpose of obtaining a charter for the Canadian Canal Corporation, which proposes to build a ship canal from Georgian Bay to Toronto.

PROPOSALS OPEN

For Proposals see pages 56, 58, 60, 61, 62 AND 63.

WATER WORKS.

Bids Close.		See Eng. Record.
Jun. 13.	Laying pipe, etc., Cincinnati, O. (2 prop.). Adv. May 20 to Jun. 3	May 20
Jun. 13.	Well, Ft. De Soto, Fla	Jun. 10
Jun. 13.	Supplies, Camden, N. J	Jun. 10
Jun. 13.	Supplies, Camden, N. J	Jun. 10
Jun. 14.	**Well, Ft. Caswell, N. C.** Adv. May 20 to June 10.	**May 20**
Jun. 14.	Water system, Ft. Sam Houston, Tex.,	Jun. 10
Jun. 14.	Water tank, etc., Ft. Sill, Okla Ter	Jun. 10
Jun. 15.	Canal, etc., Minidoka, Idaho Adv. Apr. 29 to May 27.	Apr. 22
Jun. 15.	**Dam, etc., Casper, Wyo** Adv. Apr. 29 to May 20.	**Apr. 29**
Jun. 15.	**Controlling works, etc., Tahoe, Cal** Adv. May 6 to 27.	**May 6**
Jun. 15.	**Purification wks., etc., Columbus, O.** Adv. May 13 to June 10.	**May 13**
Jun. 15.	Well, etc., Waco, Tex.	Jun. 3
Jun. 15.	Gate Valves, Chicago, Ill.	Jun. 3
Jun. 15.	Bolivar, Tenn.	Jun. 3
Jun. 15.	Laying pipe, etc., Oswego, N. Y. Adv. June 3, 10.	Jun. 3
Jun. 15.	Water works, Kimball, S. D.	Jun. 3
Jun. 15.	Remov. of crib, Cleveland, O. Adv. June 3, 10.	Jun. 3
Jun. 15.	Mains, Ft. Wood, N. Y. H., N. Y. Adv. June 3, 10.	Jun. 3
Jun. 15.	Water system, Ft. Michie, N. Y.	Jun. 10
Jun. 15.	Reservoir, etc., Ft. Mott, N. J. Adv. Jun. 10.	Jun. 10
Jun. 15.	Distilling plant, Ft. Terry, N. Y.	Jun. 10
Jun. 17.	System, Ft. Levett, Me.	Jun. 10
Jun. 19.	**Purchase of engines, etc., Cleveland, O.** **Adv. May 20.**	**May 20**
Jun. 19.	Improv. system, Lamberton, Minn.	Jun. 10
Jun. 19.	Improv., Wheaton, Minn.	Jun. 10
Jun. 22.	Alma, Neb. Adv. May 27 to June 10.	May 27
Jun. 22.	Liberty, Mo. Adv. Jun. 10.	Jun. 10
Jun. 22.	Manistique, Mich. Adv. Jun. 10.	Jun. 10
Jun. 22.	System, Cookeville, Tenn. Adv. Jun. 10.	Jun. 10
Jun. 23.	Pipe, etc., Winnipeg, Man. Adv. Jun. 3, 10.	Jun. 3
Jun. 24.	**Reservoir, Guantanamo, Cuba**	**May 20**
Jun. 24.	Pipe, etc., Norfolk, Va. Adv. Jun. 10,	Jun. 10
Jun. 26.	Taking down stand pipe, etc., Sherman, Tex. Adv. Jun. 3	Jun. 3
Jun. 26.	System. Highlands, N. J. Adv. Jun. 10.	Jun. 10
Jun. 27.	Pipe laying, Cincinnati, O.	Jun. 3
Jun. 28.	**Irrig. work, Billings, Mont.** Adv. May 6 to June 10.	**May 6**
Jun. 28.	**Pump sta., etc., Huntley, Mont.** **Adv. May 6 to June 10.**	**May 6**
Jun. 30.	Pumps, etc., Toledo, O. Adv. June 3, 10.	Jun. 3
Jun. —.	**Prescott, Wash.**	**Apr. 1**
Jun. —.	Alma, Wash.	Apr. 22
Jun. —.	**Pumps, etc., Richland, Ga.**	**Apr. 22**
Jun. —.	Pipe, etc., Thibodaux, La.	Apr. 22
Jul. 1.	Water works, Winside, Neb.	Jun. 3
Jul. 1.	Cottage Grove, Ore.	Jun. 10
Jul. 3.	**Reservoir, Winnipeg, Man.** **Adv. June 3, 10.**	Jun. 3
Jul. 17.	Bishopville, S. C. Adv. June 3, 10.	Jun. 3

SEWERAGE AND SEWAGE DISPOSAL.

Jun. 13.	Milton, Pa.	May 27
Jun. 13.	Washington, D. C.	Jun. 10

Plaquemine, La.—The following are the bids opened May 29 by Lieut.-Col. Clinton B. Sears, Corps Engrs., U. S. A., at New Orleans, for excavation and construction of approaches of lock at Plaquemine: (*a*) Hunter & Frey, Memphis, Tenn. (*b*) Christie & Lowe, Chicago, Ill.; (*c*) McGee & Co., Kansas City, Mo.; (*d*) W. O. Burton & Co., New Orleans; (*e*) Penn Bridge Co., Beaver Falls, Pa.

	a	*b*	*c*	*d*	*e*
1,650 50-ft. piles	$12.00	$16.40	$9.50	$12.50	$11.40
2,100 25-ft. piles	8.00	11.45	6.65	8.75	7.70
40,000 cu. yds. excavation	.62	1.15	.50	.40	.98
10,000 cu. yds. concrete	6.50	9.25	6.25	5.50	7.87
11 snubbing posts	40.00	66.00	20.00	20.00	45.00
Total	$134,840	$190,331	$112,360	$110,220	$153,375

New York, N. Y.—The following are the bids opened June 1 by the Comrs. of Parks for constructing entrances to Bronx Park from Mosholu Parkway and from Woodland Road; (*a*) D. Cuozzo, 150 Nassau St.; (*b*) Bart Dunn, 253 E. 68th St. (*c*) Gallo & Pittelli, 127 Mulberry St.; (*d*) M. J. Leahy, 1446 Prospect Ave. (*e*) John B. Malatesat 3172 Jerome Ave.; (*f*) Ashbul G. Vermilye, 1199 Boston Road:

	a	*b*	*c*	*d*	*e*	*f*
500 cu. yds. earth excav.	$.50	$.01	$.75	$.35	$.50	$.25
8,000 cu. yds. borrowed embkmt.	.50	.70	.25	.52	.80	.60
100 cu. yds. concrete foundations	7.00	5.00	10.00	4.00	5.00	4.50
1,050 cu. yds. ruble masonry in foundations	5.00	6.20	7.00	4.75	4.50	3.75
1,100 cu. yds. broken range Ashlar masonry	9.00	8.32	9.00	7.00	6.00	8.00
2,000 cu. ft. granite coping, bridge seats and steps	3.25	3.09	2.00	3.40	2.00	5.25
		Lump sum				
160 lin. ft. iron railing	.75	320.00	320.00	5.00	...	1.50
Total	$26,720	$28,267	$24,945	$24,227	$22,475	$28,614

**Items marked thus give the names of parties awarded contracts.*

Jun.	14.	Ft. Sam Houston, Tex	Jun. 10
Jun.	14.	Providence, R. I.	Jun. 10
Jun.	15.	Cincinnati, O.	May 27
Jun.	15.	East Syracuse, N. Y Adv. Jun. 10.	Jun. 10
Jun.	15.	Ft. McPherson, Ga	Jun. 10
Jun.	15.	Buffalo, N. Y	Jun. 10
Jun.	15.	Indiana, Pa.	Jun. 10
Jun.	16.	Le Sueur, Minn.	Jun. 10
Jun.	16.	Bronxville, N. Y.	Jun. 10
Jun.	16.	Vinton, Ia.	Jun. 10
Jun.	17.	Oconto, Wis. Adv. May 20, 27.	May 20
Jun.	17.	Ft. Levett, Me.	Jun. 10
Jun.	17.	University Place, Neb.	Jun. 10
Jun.	20.	Chicago, Ill. Adv. May 27 to Jun. 10.	May 27
Jun.	20.	Waterbury, Conn. Adv. May 20 to Jun. 10.	May 20
Jun.	20.	Chicago, Ill.	Jun. 10
Jun.	20.	New York, N. Y	Jun. 10
Jun.	21.	Greensburg, Ind.	Jun. 3
Jun.	22.	Janesville, Wis.	Jun. 10
Jun.	22.	Manistique, Mich. Adv. Jun. 10.	Jun. 10
Jun.	22.	Galveston, Tex Adv. June 3, 10.	Jun. 3
Jun.	24.	Norfolk, Va. Adv. Jun. 10	Jun. 10
Jun.	24.	Ravenna, O.	Jun. 10
Jun.	26.	London, O.	Jun. 10
Jun.	27.	Cleveland Heights, O	Jun. 3
Jun.	27.	Greensburg, Ind. Adv. Jun. 10.	Jun. 10
Jun.	—.	Sacramento, Cal.	May 13
Jul.	1.	Morgantown, N. C.	Jun. 3
Jul.	3.	Brainerd, Minn.	Jun. 10

BRIDGES.

Jun.	13.	Miniota, Man.	May 27
Jun.	13.	Kingston, Ga.	May 27
Jun.	13.	Berwick, Pa.	Jun. 3
Jun.	15.	Ainsworth, Neb.	May 20
Jun.	15.	Elmira, N. Y. Adv. June 3, 10.	Jun. 3
Jun.	15.	Zanesville, O.	Jun. 3
Jun.	15.	Indianapolis, Ind.	Jun. 3
Jun.	15.	Charleston, W. Va. Adv. June 3.	Jun. 3
Jun.	15.	Washington, D. C. Adv. Jun. 3.	Jun. 3
Jun.	15.	Warsaw, Ind.	Jun. 10
Jun.	16.	Nevada City, Cal.	Jun. 10
Jun.	17.	Chesley, Ont.	May 20
Jun.	17.	Racine, Wis.	Jun. 10
Jun.	19.	Medina, O.	Jun. 10
Jun.	19.	Allenhurst, N. J	Jun. 10
Jun.	19.	Jersey City, N. J	Jun. 10
Jun.	20.	Cadillac, Mich. Adv. May 13 to 27.	May 13
Jun.	20.	Fargo, N. D.	Jun. 3
Jun.	20.	Columbus City, Ind	Jun. 10
Jun.	20.	O'Neil, Neb.	Jun. 3
Jun.	20.	Tacoma, Wash.	Jun. 3
Jun.	20.	New York, N. Y	Jun. 10
Jun.	22.	Paterson, N. J.	Jun. 10
Jun.	24.	Ada, Mich. Adv. June 3, 10.	Jun. 3
Jun.	24.	Moline, Ill.	Jun. 10
Jun.	26.	Muir, Mich.	Jun. 10
Jun.	28.	Tiverton, R. I. Adv. June 3, 10.	Jun. 3
Jul.	3.	Natchitoches, La.	Jun. 10
Jul.	5.	Tillamook, Ore.	May 27
Jul.	5.	Vale, Ore	Jun. 3
Jul.	6.	Redding, Cal.	May 27
Jul.	6.	Lawrenceville, Ga.	Jun. 3
Jul.	11.	Castlewood, S. D.	Jun. 10

PAVING AND ROADMAKING.

Jun.	13.	Painesville, O.	Jun. 3
Jun.	13.	Cleveland, O.	Jun. 10
Jun.	14.	Freehold, N. J.	May 27
Jun.	14.	Ft. Strong, Mass.	May 27
Jun.	14.	Brooklyn, N. Y.	May 27
Jun.	14.	Hoboken, N. J.	Jun. 3
Jun.	14.	Cincinnati, O.	Jun. 10
Jun.	14.	Baraboo, Wis.	Jun. 10
Jun.	14.	Hoboken, N. J.	Jun. 10
Jun.	15.	Cincinnati, O.	May 27
Jun.	15.	Corning, N. Y. Adv. May 27 to Jun. 3.	May 27
Jun.	15.	Buffalo, N. Y.	Jun. 10
Jun.	15.	Key West, Fla	Jun. 10
Jun.	15.	Washington, D. C	Jun. 10
Jun.	15.	Bellevue, Pa.	Jun. 10
Jun.	15.	Brooklyn, N. Y.	Jun. 10
Jun.	15.	Alliance. Pa.	Jun. 10
Jun.	15.	Des Moines, Ia.	Jun. 10
Jun.	15.	Ft. D. A. Russell, Wyo	Jun. 10
Jun.	16.	Cincinnati, O.	May 20
Jun.	16.	Terrace Park, O.	Jun. 3
Jun.	16.	Lisbon, O.	Jun. 3
Jun.	17.	La Crosse, Wis.	May 27
Jun.	17.	Niagara Falls, Can.	Jun. 10
Jun.	17.	Grand Junction, Colo	Jun. 10
Jun.	19.	New Orleans, La. Adv. May 13 to Jun. 10.	May 13
Jun.	19.	Morristown, N. J. Adv. May 27 to Jun. 10.	May 27
Jun.	19.	Marietta, Wis.	Jun. 3
Jun.	19.	Jersey City, N. J	Jun. 10
Jun.	19.	Cincinnati, O.	Jun. 10
Jun.	19.	Ft. Preble, Me.	Jun. 10
Jun.	20.	Bedford, Ind.	Jun. 10
Jun.	20.	New York, N. Y	Jun. 10
Jun.	20.	Napoleon, O.	Jun. 10
Jun.	21.	Central City, W. Va Adv. Jun. 3, 10.	Jun. 3
Jun.	22.	Delaware, O.	Jun. 3
Jun.	22.	East Liverpool, O.	Jun. 10
Jun.	22.	Concord, N. H.	Jun. 10
Jun.	23.	Steubenville, O.	Jun. 3
Jun.	23.	Glendale, O.	Jun. 3
Jun.	26.	Cincinnati, O.	Jun. 3
Jun.	27.	Boise, Idaho	Jun. 10
Jun.	28.	Cincinnati, O.	Jun. 10
Jun.	28.	Portsmouth, O.	Jun. 10
Jun.	28.	New Brunswick, N. J	Jun. 10
Jun.	—.	Council Bluffs, Ia.	May 20
Aug.	1.	Belvidere, Ill.	May 20
Jul.	1.	Cleveland, O.	Jun. 10

POWER, GAS AND ELECTRICITY.

Jun.	14.	Washington, D. C.	Jun. 3
Jun.	14.	Kearny, N. J.	Jun. 3
Jun.	14.	Baltimore, Md.	Jun. 10
Jun.	15.	Selingsgrove, Pa.	May 27
Jun.	15.	Bolivar, Tenn.	Jun. 3
Jun.	15.	Ft. Mansfield, R. I.	Jun. 10
Jun.	16.	Grand Haven, Mich. Adv. May 27 to Jun. 10.	May 27
Jun.	17.	Ellis Island, N. Y. Harbor	Jun. 3
Jun.	19.	Ft. Warren, Mass.	Jun. 3
Jun.	19.	Ft. Mackenzie, Wyo.	Jun. 10
Jun.	19.	Brooklyn, N. Y.	Jun. 10
Jun.	19.	W. New Brighton, S. I., N. Y.	Jun. 10
Jun.	19.	New York, N. Y.	Jun. 10
Jun.	19.	Long Island City, L. I., N. Y.	Jun. 10
Jun.	19.	Youngstown, O.	Jun. 10
Jun.	20.	Dunn, N. C.	Jun. 3
Jun.	20.	Washington, D. C.	Jun. 3
Jun.	20.	Portland, Me. Adv. Jun. 10.	Jun. 10
Jun.	22.	Alma, Neb. Adv. May 27 to Jun. 10.	May 27
Jun.	22.	Cookeville, Tenn. Adv. Jun. 10.	Jun. 10
Jun.	26.	Ft. Bragg, Cal.	Jun. 10
Jun.	26.	Highlands, N. J Adv. June 10.	Jun. 10
Jul.	3.	Ukiah, Cal.	Jun. 10
Jul.	7.	Durant, Miss.	Jun. 3

BUILDINGS.

Jun.	13.	School, Indianapolis, Ind	Jun. 3
Jun.	13.	Plumb, etc., in hospital, Washington, D. C.	Jun. 10
Jun.	14.	Pub. Bldgs., Lawrence, Ind. Adv. May 20 to Jun. 10.	May 20
Jun.	14.	Hospital, Raleigh, N. C.	Jun. 3
Jun.	14.	Hospital, Ft. Ethan Allen, Vt.	Jun. 10
Jun.	14.	Brick work, etc., Pub. Bldg., Washington, D. C.	Jun. 10
Jun.	14.	Bus. Bldg., Dallas, Tex	Jun. 10
Jun.	14.	Church, Plano. Ill.	Jun. 10
Jun.	14.	Court House, Savannah, Tenn.	Jun. 10
Jun.	14.	Pub. bldg., material, Wash., D. C.	Jun. 3
Jun.	15.	Boilers in prison, New York, N.Y.	Jun. 10
Jun.	15.	Court House plans, New Orleans, La.	Feb. 25
Jun.	15.	Synagogue plans, Houston, Tex.	Apr. 15
Jun.	15.	Court House plans, New Orleans, La.	Apr. 22
Jun.	15.	Pub. bldg., **Honolulu, H. I.**	**Apr. 29**
Jun.	15.	Window screens, **etc., at Post, Key** West Barracks, Fla. Adv. May 20 to Jun. 10.	May 20
Jun.	15.	Boat House, **Key West Barracks, Fla.**	**May 20**
		Adv. May 20 to Jun. 10.	
Jun.	15.	Post bldg., Oswego, N. Y. Adv. May 27 to Jun. 10.	May 27
Jun.	15.	Post bldg., Ft. Wright, Wash.	May 27
Jun.	15.	Hospital, Patton, Cal.	May 27
Jun.	15.	School, Cleveland, O.	May 27
Jun.	15.	Barracks, Ft. Niobrara, Mont.	Jun. 3
Jun.	15.	Post Bldgs., Ft. Mackenzie, Wyo. Adv. June 3, 10.	Jun. 3
Jun.	15.	Post Bldgs., Ft. Des Moines, Ia. Adv. June 3, 10.	Jun. 3
Jun.	15.	Pub. Bldg., New York, N. Y.	Jun. 3
Jun.	15.	Shelters, Brooklyn, N. Y.	Jun. 10
Jun.	15.	Pub. Bldgs., Greenbank, Del.	Jun. 10
Jun.	15.	Jail, Savannah, Mo.	Jun. 10
Jun.	15.	Pub. Bldgs., Elyria, O.	Jun. 10
Jun.	15.	School, Elkton, Ky.	Jun. 10
Jun.	15.	School, **Johnsburg, Minn.**	Jun. 10
Jun.	16.	Htg., etc., schools, Chicago, Ill.	Jun. 10
Jun.	16.	Post Bldgs., Ft. Lincoln, N. D.	Jun. 3
Jun.	16.	Pub. Bldg., Ft. Hancock, N. J. (2 prop.). Adv. May 20 to Jun. 10.	May 20
Jun.	16.	Pub. Bldg., Towson, Md.	Jun. 3
Jun.	16.	Post Bldgs., Ft. Ontario, N. Y. Adv. Jun. 10.	Jun. 10
Jun.	16.	Steel ceilings in school, Buffalo, N. Y.,	Jun. 10
Jun.	17.	School, Toledo, O.	May 27
Jun.	17.	School, Winnipeg, Man.	Jun. 10
Jun.	19.	City Hall plans, Fresno, Cal.	Jun. 10
Jun.	19.	Vent. & Htg. School, W. New Brighton, S. I., N. Y.	Jun. 10
Jun.	19.	**P. O. Bldg., Atlantic, Ia.**	**May 20**
Jun.	19.	**School, Grand Rapids, Mich.**	**May 20**
Jun.	19.	Light House, Baltimore, Md. Adv. May 27.	May 27
Jun.	19.	School, St. Johns, O.	May 27
Jun.	19.	School, New York. N. Y.	Jun. 3
Jun.	19.	Alter. to schools, New Brighton, S. I. N. Y.	Jun. 10
Jun.	19.	Sanitary wk., etc., in school, Jamaica, L. I., N. Y.	Jun. 10
Jun.	19.	School, Union, N. J	Jun. 10
Jun.	20.	P. O. Bldg., Colorado Springs, Colo. Adv. May 13, 20.	May 20
Jun.	20.	School, Port Arthur, Tex.	May 27
Jun.	20.	Pub. Bldgs., Chicago, Ill	Jun. 10
Jun.	20.	Repairs to hosp., Ft. Rodman, Mass.,	Jun. 10
Jun.	20.	School, Newark, N. J	Jun. 10
Jun.	20.	Pub. bldg., Sheboygan, Mich	Jun. 10
Jun.	20.	Pub. Bldg., London, Ont	Jun. 10
Jun.	20.	Pub. bldg. equip., New York, N. Y.,	Jun. 10
Jun.	20.	Post bldgs., Ft. Monroe, Va.	Jun. 10
Jun.	20.	Post. Hosp., Ft. Wood, N. Y. H., N. Y. Adv. Jun. 10	Jun. 10
Jun.	21.	**P. O. Bldg., Winston, N. C.**	**May 20**
Jun.	21.	Htg., etc., Pub. Bldg., Ft. Bank, Mass.,	Jun. 10
Jun.	21.	Vent. and htg. school, Waldron, Ind.	Jun. 10
Jun.	21.	Jail, Baltimore, Md.	Jun. 10
Jun.	22.	School, Jersey City, N. J	Jun. 10
Jun.	23.	P. O. bldg., Vancouver, B. C.	May 27
Jun.	23.	Hospital, Dayton, O.	Jun. 3
Jun.	23.	School, Milwaukee, Wis.	Jun. 10
Jun.	24.	School, Bedford, O.	Jun. 3
Jun.	25.	Court House, Lake Village, Ark.	Jun. 3
Jun.	26.	P. O. Bldg., Niagara Falls, N. Y.	May 27
Jun.	26.	School, Poplar, Mont.	Jun. 3
Jun.	26.	School, Des Moines, Ia.	Jun. 3
Jun.	26.	Alter. to school, Long Island City, L. I., N. Y.	Jun. 10
Jun.	27.	Library. Cincinnati. O.	Jun. 3
Jun.	27.	Post-Office, Grand Forks, N. D.	Jun. 10
Jun.	27.	Vent. and htg. school, Los Angeles, Cal.	Jun. 10
Jun.	27.	School, Montclair, N. J. Adv. Jun. 10.	Jun. 10
Jun.	28.	School, Agriculture College, Mich.	Jun. 10
Jun.	28.	P. O. Bldg., Westchester. Pa.	May 27
Jun.	28.	Htg. court house, Shelbyville, Ind.	Jun. 10
Jun.	28.	Pub. Bldgs., Binghamton, N. Y.	Jun. 10
Jun.	29.	Hospital, Wash., D. C. Adv. June 3, 10	Jun. 3
Jun.	29.	Exter. work, Senate Bldg., Washington, D. C.	Jun. 10
Jun.	30.	Lodge, Diamond, Ind.	Jun. 3
Jun.	**—.**	**School plans, Stillwater, Okla. Ter.**	**May 20**
Jul.	1.	Bus. bldg., Atlantic City, N. J	Jun. 10
Jul	1.	Pub. Bldg., Washington, D. C. Adv. May 27 to Jun. 10.	May 27
Jul.	1.	**Pub. Bldg., Baltimore, Md.**	**May 20**
Jul.	1.	Court House, Wallace, Idaho	Jun. 3
Jul.	5.	Pub. Bldg. plans, Springfield, Mass.	Jun. 10
Jul.	5.	Court House plans, Montgomery, Ala.	May 27
Jul.	6.	Hospital, Dunlaps, Ia	Jun. 3
Jul.	6.	School, Cleveland Heights, O.	Jun. 10
Jul.	11.	Hospital, Goshen, Ind.	Jun. 10
Jul.	12.	Htg. court house, Cambridge, Minn.,	Jun. 10
Jul.	20.	Custom House, San Francisco, Cal.	Jun. 3
Jul.	30.	Court House improv., Leesville, La.	May 13
Aug.	**1.**	**Y. M. C. A. Bldg., Spokane, Wash.**	**Apr. 29**

MISCELLANEOUS.

Jun.	13.	**Pier, Gallipolis, O.**	**May 20**
Jun.	13.	**Pier, Maysville, Ky.**	**May 20**
Jun.	13.	Dam, Iowa City, Ia. Adv. May 27, Jun. 3.	May 27
Jun.	13.	Supplies, Pensacola, Fla	Jun. 3
Jun.	13.	Cars, Guantanamo, Cuba	Jun. 3
Jun.	13.	Cable, etc., Washington, D. C.	Jun. 3
Jun.	14.	Bldg. Material, etc., **West Point, N.Y.**	**May 20**
		Adv. May 20 to Jun. 10.	
Jun.	14.	Rubblestone, **Boston, Mass.** Adv. May 20 to Jun. 10.	**May 20**
Jun.	14.	Tower Philadelphia, Pa.	May 20
Jun.	14.	Elevator, Savannah, Ga.	Jun. 3
Jun.	**15.**	**Pole and telephone line, Minidoka,** Idaho. Adv. Apr. 22 to May 27.	Apr. 22
Jun.	**15.**	**Wharf,** etc., **Honolulu**	Apr. 29
Jun.	15.	Trestles, etc., **Louisville, Ky.** Adv. May 20 to Jun. 10.	**May 20**
Jun.	15.	Excav., etc., Panama Adv. May 20 to Jun. 10.	May 20
Jun.	15.	Dredging, Mobile, Ala. Adv. May 20 to Jun. 10.	May 20
Jun.	15.	Remov. wreck, Jacksonville, Fla. Adv. May 20 to Jun. 10.	May 20
Jun.	15.	Jetty work, Sabine Pass, Tex. Adv. May 27 to Jun. 10.	May 27
Jun.	15.	Ditches, St. Paul, Minn.	Jun. 3
Jun.	15.	Sea Wall, National Soldiers' Home, Va.	Jun. 3
Jun.	15.	Gravel, Brooklyn, N. Y.	Jun. 10
Jun.	16.	Dredging, Seattle, Wash	Jun. 3
Jun.	16.	Cement, New York, N. Y.	Jun. 10
Jun.	19.	Dredging, Norfolk, Va. Adv. May 27, Jun. 3.	May 27
Jun.	19.	Dredging, Wilmington. Del. Adv. May 20 to Jun. 10.	May 20
Jun.	19.	Supplies, Rock Island, Ill.	May 27
Jun.	19.	Breakwater, Cleveland, O.	May 27
Jun.	19.	Wharf, Winthrop, Mass.	Jun. 3
Jun.	19.	Seawall, Ft. Andrews, Peddock's Island, Mass.	Jun. 3
Jun.	19.	Pier, New York, N. Y.	Jun. 10
Jun.	20.	Searchlight outfit, **Washington, D. C.** Adv. May 20 to Jun. 10.	**May 20**
Jun.	20.	Dredging, Wilmington, Del. Adv. May 27 to Jun. 10.	May 27
Jun.	20.	Dredging, Baltimore, Md. Adv. May 27 to Jun. 10.	May 27
Jun.	20.	Dredging, Detroit, Mich. Adv. May 27 to Jun. 10.	May 27
Jun.	20.	Elevator, Washington, D. C.	May 27
Jun.	20.	Levee, Walnut Hill, Ark.	May 27
Jun.	20.	Sea Wall, Ft. Mifflin, Pa.	Jun. 3
Jun.	20.	Stone, etc., Vicksburg, Miss. Adv. June 3, 10.	Jun. 3
Jun.	20.	Supplies, Washington, D. C.	Jun. 3
Jun.	20.	Pier, Cleveland, O.	Jun. 3
Jun.	20.	Supplies, Washington, D. C.	Jun. 3
Jun.	20.	Piers, Ft. Rodman, Mass.	Jun. 10
Jun.	20.	Elevator, New York, N. Y.	Jun. 10
Jun.	20.	Levee, Vicksburg, Miss.	Jun. 10
Jun.	21.	Light house supplies, Tompkinsville, S. I., N. Y. Adv. May 27 to Jun. 10.	May 27
Jun.	21.	Dredging, Baltimore. Md. Adv. May 27 to Jun. 10.	May 27
Jun.	21.	Levee work, Hopefield, Ark. Adv. May 13, 27.	May 27
Jun.	21.	Dredging, Wilmington, Del.	May 27
Jun.	22.	Dredging, Detroit, Mich. Adv. May 27 to Jun. 10.	May 27
Jun.	22.	Sea Wall, Governor's Island, N. Y. H. Adv. May 27 to June 10.	May 27
Jun.	22.	Extension of Jetty, Portland, Ore.	Jun. 3
Jun.	22.	Renewing steam pipes, National Soldiers' Home, Va.	Jun. 3
Jun.	24.	El. Ry. franchise, Hollister, Cal.	May 20
Jun.	24.	Elevator, Charleston, S. C.	Jun. 3
Jun.	26.	Telephone system, Belle Fourche, S. D. Adv. May 27 to June 10.	May 27
Jun.	26.	Dredging, Boston, Mass. (2 prop.) Adv. May 27 to June 10.	May 27
Jun.	26.	Dredging, Wilmington, Del. Adv. June 3, 10.	Jun. 3
Jun.	26.	Dike, etc., Duluth, Minn. Adv. June 3, 10.	Jun. 3
Jun.	26.	Dredging, Boston, Mass.	Jun. 3
Jun.	26.	Dredging, Charleston, S. C. Adv. June 3, 10.	Jun. 3
Jun.	27.	Dredging, Boston, Mass. Adv. Jun. 3, 10	Jun. 3
Jun.	27.	Dredging, Duluth, Minn. Adv. June 3, 10.	Jun. 3
Jun.	27.	Supplies, Washington, D. C.	Jun. 10
Jun.	28.	Jetty Work, Galveston, Tex. Adv. June 3, 10.	Jun. 3
Jun.	29.	Dredging, Prophetstown, Ill.	Jun. 10
Jun.	30.	Dredging, York, Me. Adv. June 3, 10.	Jun. 3
Jun.	30.	Dredging, Savannah, Ga. Adv. June 3, 10.	Jun. 3
Jun.	30.	Cement, Cincinnati, O.	Jun. 10
Jun.	—.	Subway, Memphis, Tenn.	May 13
Jul	**1.**	**Municipal St. Ry. system, Chicago, Ill.**	**Apr. 15**
Jul.	1.	Dredge, Chicago, Ill.	Jun. 3
Jul.	1.	Dredging, Jacksonville, Fla. Adv. Jun. 3, 10.	Jun. 3
Jul.	1.	Dredging, Montgomery, Ala. Adv. Jun. 10.	Jun. 10
Jul.	3.	Dredging, etc., Norfolk, Va. Adv. Jun. 10.	Jun. 10
Jul.	3.	Dam, etc., Mobile, Ala. Adv. Jun. 10.	Jun. 10
Jul.	3.	Bear-trap gates, Pittsburg, Pa. Adv. Jun. 3, 10.	Jun. 3
Jul.	5.	Dredging, Baltimore, Md. Adv. Jun. 10.	Jun. 10
Jul.	6.	Jetty work, Wilmington, Del. Adv. Jun. 10.	Jun. 10
Aug.	**26.**	**Coal plant, Olongapo, P. I.**	**May 6**
Sep.	1.	Steel and iron, Sydney, N. S. Wales. Adv. Apr. 8, 22; May 6, 20; June 3.	Apr. 8
Apr.	2.	'06. Harbor Work, Valparaiso, Chili. Adv. Apr. 29 to June 10	Apr. 29